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What to Invest in: A Valuation-based Framework for IP Management

Master's Thesis

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ABSTRACT OF THE
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The master's thesis introduces a valuation-based framework that helps patent owning firms identify essential activities and resources for patent licensing. The thesis utilises the resource-based view and game theory by linking the activities and resources in a firm's disposal to factors highlighted by a valuation model depicting licensing negotiations. The thesis supports firms' decision-making both in preparing for individual licensing negotiations and in business development with a licensing focus.

The analysis in the master's thesis focuses on pure patent licensing, which serves as the theoretical foundation for identifying key factors concerning patent licensing more broadly. License price formation is represented with a game-theoretic valuation model the factors of which are analysed with interviews. With expert interviews, theoretical patent management activity domains as well as their activities and resources affecting price formation in licensing negotiations are identified.

Based on the findings in the master's thesis, patent licensing is resource-intensive requiring investments in licensing and litigation activities in individual negotiations as well as in portfolio development through patenting and patent purchases as part of overall patent management. As the formation of the license price depends on the quality and commercial significance of patents and on the capabilities of the patent owner in relation to the licensee, the selection of patents and potential licensees are identified as essential activities of the licensing firm. In addition, the importance of litigation in patent licensing is highlighted as a demand generating factor for licenses.

Keywords: patent management, patent licensing, game theory, resource-based view

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DIPLOMITYÖN
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Diplomityö esittelee valuaatiopohjaisen viitekehyksen, joka auttaa patentteja omistavan yrityksen johtoa tunnistamaan patenttilisensoinnin kannalta olennaisimmat liiketoiminnan aktiviteetit ja resurssit. Työ nojaa resurssiperustaiseen näkökulmaan ja peliteoriaan linkittäen yrityksen käytössä olevat aktiviteetit ja resurssit lisenssineuvotteluja kuvaavan valuaatiomallin korostamiin tekijöihin. Työ tukee yritysten päätöksentekoa sekä yksittäisiin lisenssineuvotteluihin valmistautumisessa että liiketoiminnan kehittämisessä lisensointifokuksella.

Diplomityön analyysi on rajattu puhtaaseen patenttilisensointiin, joka lisensoinnin teoreettisena perusmuotona auttaa tunnistamaan keskeisiä tekijöitä patenttilisensointia koskien laajemmin. Patenttilisenssin hinnan muodostumista kuvataan peliteoreettisella valuaatiomallilla, jonka tekijöitä analysoidaan haastatteluilla. Asiantuntijahaastattelujen pohjalta tunnistetaan, mitkä teoreettiset patenttiliiketoiminnan osa-alueet ja niiden aktiviteetit ja resurssit vaikuttavat hinnan muodostumiseen lisensointineuvotteluissa.

Diplomityön perusteella patenttilisensointi on resurssi-intensiivistä toimintaa, joka vaatii panostuksia niin lisensointiaktiviteetteihin ja litigointiin yksittäisten neuvottelujen tapauksessa kuin portfolion kehittämiseen patentoinnin ja patenttiostojen kautta yksittäisiä neuvotteluja laajemmin. Koska lisenssihinnan muodostuminen riippuu patenttien laadusta ja taloudellisesta merkittävyydestä ja patentin omistajan kyvykkyyksistä suhteessa lisenssin ostajaan, patenttien ja potentiaalisten lisenssin ostajien valikointi neuvotteluihin nousee keskeiseksi lisensoivan yrityksen tehtäväkokonaisuudeksi. Lisäksi litigoinnin merkitys korostuu patenttilisensoinnissa lisenssikysyntää ohjaavana tekijänä.

Avainsanat: patenttiliiketoiminnan johtaminen, patenttilisensointi, peliteoria, resurssiperustainen näkökulma	**Julkaisukieli:** englanti

PREFACE

The process of writing this thesis seems long. In a way, the journey started already in 2015 when I was writing my bachelor's thesis on the patent system and ended up working at Nokia's patent business unit. However, as it is finally reaching its conclusion, I would like to use this opportunity to thank some of the people who have supported, challenged and helped me grow as a person throughout the writing process.

My biggest thanks go to the academic trio, Pekka Sääskilahti, Tuomas Takalo and Jens Schmidt, who took the time to meet with me, discuss my thesis and challenge my thinking with their comments and questions in the middle of their busy schedules. Although the framing of the project as purely academic caused some challenges to finishing it, working with these three made up for it by making the work exciting.

I also need to thank Pekka as well as Ilkka Rahnasto for ending up working on this topic in the first place. Had it not been for them, I wouldn't have had the chance to work at Nokia as a trainee and wouldn't have been suggested this topic by Pekka as I was leaving to finish my studies in 2016.

I of course wouldn't be here without the support of my family and friends as well as my colleagues at Nordic Healthcare Group, who kindly let me babble about my topic when I needed it and believed in me even at those moments when I myself was filled with doubts. I especially want to thank Ossi Hakulinen for his support no matter the distance.

Lastly, I want to dedicate this thesis to my grandfather, Heikki Tiitinen, who worked as the head of intellectual property at the end of his career in Outokumpu.

Emmi Peltonen

October 2018, Helsinki

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1. INTRODUCTION

This thesis analyses how patent management as an organisational capability should be built to support value appropriation from patents when the patent strategy pursued by the firm is focused on licensing. The analysis focuses on key factors impacting licensing negotiations and how these link to different patent management activities and resources based on interviews with patent management experts. The licensing negotiation is theoretically summarised with a game theoretic licensing valuation model which, together with key patent management activity domains, serve as the framework for analysing value appropriation in the context of a single negotiation and as a result of long-term efforts throughout patent management.

The thesis contributes to the resource-based literature by linking the exchange value of a resource to capability features contributing to value appropriation and to patent management literature by identifying key patent management activities and resources from the specific strategic standpoint of licensing. The thesis also bridges some of the gap between economic theory and managerial insight by combining game theory with resource-based thinking. For practitioners, the thesis provides a valuation-based framework to support decision-making and business development in patent licensing.

1.1. MOTIVATION

The practical challenge for patent owning firms is how to make the most out of their assets. Patents as assets are uncertain recourses that cost to be maintained and have only the potential to be valuable to their owner before used. They get granted as a result of an imperfect process, which is mitigated by the fact that they can be invalidated (Teece 2000), and commercially only a handful of them can be expected to return their investment as most of their measured value is focused on few top-earning ones (Pakes 1986; Scherer and Harhoff 2000).

On the other hand, a focus on value appropriation from patents can be highly lucrative – something which IBM's jump from $30 million in 1990 to nearly $1 billion in yearly patent licensing revenue in 2000 (Rivette and Kline 2000) and Nokia's more recent €1.6 billion in patent, brand and technology licensing revenue in 2017 (Nokia Corporation 2018) indicate. To help firms in focusing their limited resources to key issues instead of squandering them all over, this thesis aims to shed

light on what patent owning firms should consider investing in based on target outcomes.

Value appropriation from patents is not automatic (Pisano 2006) and should be considered as endogenous to the firms that own them. In practice, patents covering significant commercial inventions from an objective standpoint can lead to different subjective outcomes based on how and by whom they are used. Some firms may be unable to appropriate the potential value from their patents when others may on the other hand be able to "skilfully enhance the impact of patent rights through coordinated (and typically resource intensive) actions" by their patent management (Somaya 2012: 1086).

Patent owning firms have two general ways to appropriate value from their patents: by implementing them in their own products or processes and using them as protection against rival businesses, or by licensing them to other players and benefiting from their ability to commercialise the patented technologies. The patent management of the firm can be built around the strategy the firm decides to pursue. How this should be done and what the firms should invest in especially when pursuing a licensing-focused strategy, are however not fully answered by extant literature. According to Somaya (2012), much of the managerial literature related to patent management and generic patent strategies has focused on distinct activities such as patenting. What has been missing is attempts to explain how different activities should be coordinated based on generic or specific patent strategies. For example, although Reitzig and Puranam (2009) study coordination of different types of patent-related activities, their focus is on patenting and value appropriation from research and development (R&D) – not on value appropriation from patents, which patent strategies focus on. In this thesis, patent management activities as a whole are analysed from the perspective of a patent owning firm pursuing a leveraging strategy specifically focused on licensing.

On expected terms, value appropriation in the case of patent licensing can be thought to occur at the moment firms reach an agreement on the price of a license. The target outcome is to maximise the appropriated value – license price in a given deal or throughout licensing as the sum of license prices in separate deals. How license prices are formed in theory have been studied by economists and their findings can be used to pinpoint key issues the patent management of the firm should be built to address. In this thesis, a descriptive model of license price formation in a single

licensing negotiation is used to help create logical paths from licensing outcomes to distinct patent management activities and resources affecting them. As firms can be challenged by decisions concerning current licensing prospects as well as considering how to build their patent management overall to support a licensing-focused strategy, this thesis aims to connect the dots from licensing outcomes to patent management both in the context of a single negotiation and overall capability building.

1.2. RESEARCH QUESTIONS

The research problem of this thesis is compressed in the following question:

What activities and resources should a patent owning firm invest in to appropriate value from its patents in licensing negotiations?

The research problem is based on the definition, that patent management as a capability consists of organised activities that call upon different types of resources. To answer the research problem, two research questions are formulated:

RQ1: What activities and resources contribute to the patent owner's appropriated value in a single licensing negotiation?

RQ2: What activities and resources contribute to the patent owner's appropriated value throughout patent management?

RQ1 focuses on the short-term perspective of a single licensing negotiation. It addresses the managerial question of what are the key activities and resources needed to appropriate value from existing patents when aiming to license whereas RQ2 focuses on the long-term view of the different activities and resources that can be used to impact the patent owning firm's likelihood of generating revenue by licensing patents. By answering the research questions, the research problem is answered on two levels: (1) by identifying what a patent owning firm should invest in in a single negotiation to positively impact the licensing outcome, and (2) what it should invest in if it aims to build its patent management capability based on a licensing-focused strategy.

The research questions are answered by analysing both theoretical and empirical findings on licensing from literature and from expert interviews. The process of answering the research problem consists of three steps, that start from the licensing outcome, license price, in a single licensing negotiation and end by linking different factors impacting the licensing negotiation based on interviews to specific patent management activities and resources identified from literature as well as from the interviews (figure 1). The first step is conducted by presenting a game-theoretic model of license price formation in pure patent licensing that summarises the key factors affecting prices of patent licenses based on economic theory. The model is used to structure the interviews as well as the analysis around the research questions. Also, by focusing on pure patent licensing, which can be regarded as the theoretical foundation for patent licensing, the model helps identify key aspects concerning patent licensing more generally.

Figure 1: Approach to analysing research questions

The theoretical framework of the thesis including the game-theoretic strategic valuation model are discussed in chapter 2. Methodology is described in chapter 3 and the findings from interviews are discussed in chapter 4. In chapter 5, the answers to the research questions, theoretical and empirical contributions and the limitations and identified future research topics of the study are discussed. Chapter 6 concludes the thesis.

2. THEORETICAL FRAMEWORK

2.1. A FOCUS ON CAPABILITIES

The purpose of this chapter is to lay out the theoretical foundations of resources and capabilities that will help later on when they are analysed in the specific context of patent licensing. First terminology is gone through after which the basic principles of the resource-based view will be discussed. Resource value and value creation and appropriation are discussed in chapter 2.1.3.

2.1.1 TERMINOLOGY

The terminology used in this thesis is based on the definitions used by Helfat and Peteraf (2003). An *organisational capability* "refers to the ability of an organization to perform a coordinated set of tasks, utilizing organisational resources, for the purpose of achieving a particular end result" (ibid.: 999). These sets of tasks can be also referred to as *activities* or processes. To perform these activities (level 1 in figure 2), capabilities call upon *resources* (level 2 in figure 2), which can be seen as assets or inputs to production "that an organization owns, controls or has access to on a semi-permanent basis" (ibid.: 999). Capabilities can also call upon other capabilities (ibid.) which again call upon particular resources.

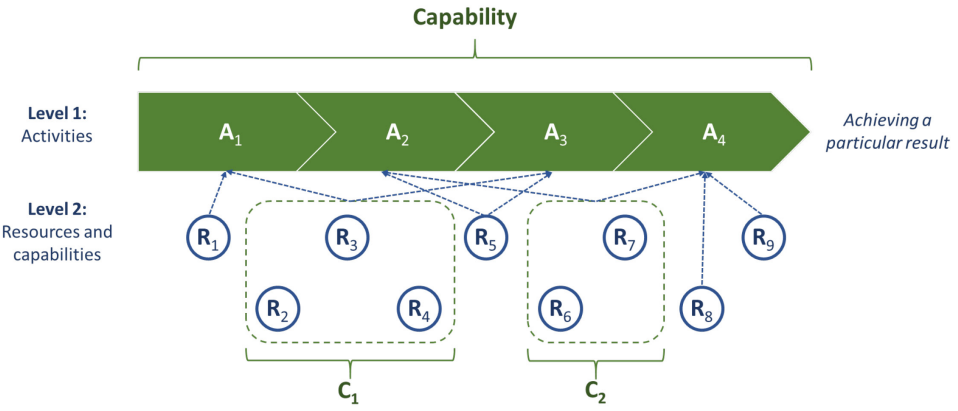

Figure 2: Capability as a set of activities and resources based on Helfat and Peteraf (2003)

Wernerfelt (1984, p. 172) refers to Caves (1980) as he defines resources as "those (tangible and intangible) assets which are tied semi-permanently to the firm". Examples of tangible assets include e.g. plants, employees and liquid monetary assets whereas intangible assets include e.g. relationships and intellectual property.

Resources are not firm-specific as they can be bought from the asset market. As Makadok (2001: 389) argues: "If the organization were completely dissolved, its capabilities would also disappear, but its resources could survive in the hands of a new owner." In this thesis, the resource in focus is a patent – an intangible asset, which can change ownership and survive as long as it is maintained properly.

Capabilities are difficult to buy on the market without buying a company or its subunit (Makadok 2001). According to Teece et al. (1997: 528), because of the non-tradability of capabilities, and soft assets in general, "they must be built". This can take time as "in order for something to qualify as a capability, it must work in a reliable manner" (Helfat and Peteraf 2003: 999). Here, the capability in focus is patent management and what its critical features are that enable the appropriation of value from patents through licensing.

Capabilities are usually examined as either static or dynamic, or as Helfat and Peteraf (2003) describe them, operational or dynamic. *Operational capabilities* are "high-level routine[s] (or collection[s] of routines) that [confer] upon an organization's management a set of decision options for producing significant outputs of a particular type" (Winter 2000: 983). They are organized, to an extent repetitive, tasks or activities that are developed to meet specified objectives. *Dynamic capabilities*, on the other hand, are capabilities that develop operational capabilities (Teece et al. 1997), although capabilities can also develop without having other specific capabilities built to develop them (Helfat and Peteraf 2003). In this thesis, the focus is on patent management as an operational capability.

The resource-based view literature uses also the term *competence* which refers to ways of using resources and cover such issues as management systems, processes, cooperation between people and ability to learn and use gained knowledge (Johnsson et al. 2011). In practice, resources and competencies are tied closely together. The effective use of resources requires competencies and similarly competencies should be applied to resources to produce valuable results. As the term is so closely linked to resources and mixes easily with capabilities, in this thesis mostly the two latter terms will be used. For instance, lawyers or patent engineers are discussed as resources with a certain skillset and an ability to learn whereas the coordinated use of resources will be referred to as activities or processes that combined form a capability. Competencies are however used as a term to analyse

which resources, based on interviews, are needed for patent management when a patent owning firm focuses on licensing.

The terminology in the resource-based view literature is overall mixed as clear distinctions of what constitutes a resource, a competence and a capability are often evaded. Based on the definitions put to use in this chapter, resources, capabilities and competencies have been used to describe similar practical concepts. For instance, Wernerfelt (1984) mixes resources with competencies by referring to managerial skills as resources although it could be argued that these are in fact competencies and directly transmit into how the actual resources of the organisation (e.g. facilities, employees, intellectual property etc.) are used. Similarly, Priem and Butler (2001) list strategic planning as a resource although it is more of a capability or an activity constituting of resources (e.g. people in top management) and competencies (e.g. development processes). Also, to avoid mixing terms, few researchers have chosen to include competencies and capabilities in the same text (Johnsson et al. 2011).

2.1.2 THE RESOURCE-BASED VIEW

An organisation's strategic situation can be analysed from multiple perspectives, focusing on the industry the firm operates in (e.g. Porter 1979), interaction with competitors (e.g. Shapiro 1989), the semi-permanent capabilities of the firm (e.g. Wernerfelt 1984) or the dynamic capabilities of the firm (e.g. Teece et al. 1997). The first two perspectives "share the view that rents flow from privileged product market positions" whereas the latter two perspectives focus on "isolating mechanisms as the fundamental determinants of firm performance" (Teece et al. 1997: 510). Here, the focus is on the third perspective – the resource-based view.

The resource-based view, introduced by Wernerfelt (1984) and contributed to by Barney (1986, 1991, 2001), Dierickx and Cool (1989) and others, focuses on the semi-permanent capabilities of the firm. It regards firms as heterogeneous in regards to their capabilities, sees resources as sticky and focuses on the importance of firm-specific factors in wealth creation (Wernerfelt 1984; Barney 1991; Peteraf 1993; Teece et al. 1997; Rumelt 1991).

In the resource-based view, the wealth generated by the firm can be imputed to bundles of scarce resources (Lippman and Rumelt 2003b). Resources that are

valuable (Barney 1991; Peteraf 1993), rare (Barney 1991; Peteraf 1993), inimitable (Barney 1991; King and Zeithaml 2001) and non-substitutable (Barney 1991; Peteraf and Bergen 2003) are recognised as the sources of competitive advantage and these adjectives form Barney's (1991) VRIN framework. Competitive advantage is either defined on the firm-level or on the level of an industry (Barney 2001). In the case of the industry, competitive advantage can be defined as a firm or unit generating above average returns compared to the industry average (Priem and Butler 2001). On the firm level, the comparison is made with either current or potential competitors (Barney 1991) or the comparison is made with the expectations of shareholders (Barney 1986).

Barney (1991) defines resource value, rarity, inimitability and non-substitutability followingly: Resources are valuable "when they enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness" (ibid.: 106) and rare if they are possessed by fewer firms than would be needed to generate perfect competition dynamics in an industry. In other words, to be valuable and rare and thus sources for competitive advantage resources need to enable the earning of profits. To be a source for sustained competitive advantage, resources need to be also imperfectly imitable and difficult to substitute. Inimitability can be due to unique historical conditions through which the resource was obtained, causal ambiguity between the resource and the firm's competitive advantage or the advantage generated being socially complex (see Dierickx and Cool 1989). Substitutability occurs when equivalent resources exist which can be used to implement the same strategies and which are either rare or inimitable.

Dierickx and Cool (1989) extend the concept of valuable resources by focusing on tradability and view rare, difficult-to-price resources as valuable. According to the researchers, resources that are freely tradeable do not "entail a sustainable competitive advantage". Lippman and Rumelt (2003a; 2003b) criticise both notions. First, they note that factors can be valuable or valueless whether or not they be priced on the factor market (ibid. 2003b) and suggest that the researchers (Dierickx and Cool 1989) assume that resources which are tradeable hold the same value for all possible acquirers pointing out that resources can be wealth-enhancing although they are tradeable if there are superior complementarities between the resource and the acquirer (Conner 1991) or information among players in the asset market is asymmetric (Lippman and Rumelt 2003a).

The notion in some of the earlier work in the resource-based view has been that combined together the different sources of competitive advantage could be sources for sustained competitive advantage (Barney 1991), a concept earlier introduced by Porter (1985). In his 2001 article, Barney gives the example of a resource that is rare and valuable being a source of competitive advantage but a resource meeting all the criteria in the VRIN framework in addition to non-transferability (Dierickx and Cool 1989) to be a potential source for sustained competitive advantage. This notion has however been criticised for assuming static capabilities as sustainable sources of competitive advantage in the world of business that develops and changes. Resources that are currently the cornerstones of a firm's competitive advantage may not be such in ten or five or two years if the business landscape changes no matter how valuable, rare, inimitable and difficult to substitute they are at the moment. (Teece et al. 1997)

Despite the criticism Barney's VRIN framework may earn, the focus on firm-specific capabilities in analysing wealth creation is justified as according to Rumelt (1991: 167), "the most important sources of economic rents are business-specific". In his study of explanatory factors behind the variance in rate of returns of FTC Line of Business reporting units Rumelt finds that stable business unit effects are six times more important explainers of the dispersion of returns among business units (46 % of the variance) than stable industry effects are (only 8 % of the variance). In other words, business units differ more within industries than industries do from one another.

2.1.3 RESOURCE VALUE, VALUE CREATION AND APPROPRIATION

Resource value has been referred to with different terms and by focusing on slightly different things. One way to look at the value of a resource is to think about its value in terms of its *private value*, the value it brings to its owner, and its *social value*, the value it brings to society overall. Another way to look at resource value, is to separate the resource's value potential from the value it brings to its owner. Porter (1991) refers to potential value as the resource's *intrinsic value* whereas Bowman and Ambrosini (2000) discuss value potential in terms of *use value* and the value the owner is able to realise as *exchange value*. The exchange value of a resource is usually measurable whereas its use value is perceived and can differ among firms.

Firms differ in their ability and understanding of how to effectively use a resource. A way to explain the differences in firms' perceptions of the value of a resource is to think of the resource value as firm idiosyncratic and depending on the market position, resource base and known resource complementarities prior to the exchange of the resource. (Schmidt and Keil 2013) This also explains why the use value of the resource, as in the value the resource brings to its new owner, and the exchange value may differ. According to Barney (1986), this occurs usually due to differences in understanding of the value of resources among firms or luck. A company may have superior information on the use value of a resource and understand to bid on the undervalued resource on the market or it may have come to buy a resource and only later on discovers the resource to be more valuable than originally believed.

Resource value is created and appropriated by firms with their capabilities. Value creation refers to activities which create the perceived use value of a resource whereas value appropriation has to do with the firm's ability to capture the exchange value of the resource (Bowman and Ambrosini 2000). Thus, how much a firm can possibly appropriate value in the exchange of a resource depends on how much perceived use value it has been able to create. How much of this use value it is able to appropriate depends then on its bargaining power compared with the buyer (ibid.).

In this thesis, the focus is on the private value of patents to a patent owner who appropriates value from the patents through licensing. The private value depends on the different use values the patented technology has to the potential licensees. The value is realised in licensing deals where the negotiated price of the license is the exchange value of the patent license. In the research questions, exchange value is referred to as appropriated value which is analysed as the exchange value in a single licensing negotiation or as the sum of exchange values from separate licensing negotiations appropriated by the patent owner.

2.2. PATENTS AND PATENT MANAGEMENT

In this thesis, patents are regarded as valuable resources whose value is created and appropriated by the patent management capability of the patent owning firm. In the following chapters, basic aspects regarding patents and their use are discussed after which the basic activities and features of patent management are gone through. Lastly in chapter 2.2.4, generic patent strategies are discussed.

2.2.1 PATENTS AS VALUABLE RESOURCES

Innovation is costly, but once an invention has been made, the marginal costs of production can be very low (Scotchmer 2004; Posner 2005). Patents are value appropriation mechanisms which enable their owners to try to capture the value from expensive R&D efforts (Reitzig and Puranam 2009). Alternative appropriation strategies include secrecy, complementary capabilities combined with lead time and the use of other legal mechanisms although these may not be as notable as patents. (Cohen et al. 2000) Although companies often use patents in combination with alternative appropriation mechanisms (ibid.), the focus in this thesis is kept on patents and mechanisms that support their use.

Patents protect knowledge of technological inventions which can be implemented in products or processes and typically last 20 years from filing[1] the patent application conditional on paying renewal or maintenance fees (Scotchmer 2004). In order to be patentable, this knowledge needs to be new, useful and non-obvious and described in the claims in the patent document (Bessen and Raskind 1991; Guellec and van Pottelsberghe de la Potterie 2000). However, as patents are issued with limited information, these requirements are important not only in determining validity in the granting of patents but also in overturning patents later on (Lemley and Shapiro 2005). On top of validity, the claims need to be interpreted to determine what knowledge the patent actually protects. They describe the scope and limits of the property right.

Patents can be viewed as sources for competitive advantage although they do not necessarily fit all the criteria in the VRIN framework (Barney 1991). Patents are rare by definition: each patent right has to protect a unique invention or it can be invalidated. Patents can also be highly valuable although not all patents can be expected to be (Scherer and Harhoff 2000). Patents are somewhat inimitable by definition: they can usually be invented around but this can be very costly depending on the invention. Also, the substitutability of a particular patent is technology

[1] In most countries in the world, patents are assigned on a first-to-file basis. Prior to the Leahy-Smith America Invents Act (2011), the United States differed from e.g. Europe, Japan and Canada by determining priority by the first-to-invent rule. After the law was passed, the patents in the United States have also been granted to the first inventor to file the patent.

dependent and how well the value potential of patents is realised depends on the actions of the patent owning firm.

Patent value can be seen as separate from the value of the underlying invention although there is a link between the two. More specifically, the value of the patent right is based on the counterfactual of what the owner would lose if the invention were not patented by the owner. This can be thought through four different hypothetical scenarios: "(1) the invention is not made at all, (2) the invention is made but a rival owns the patent, (3) the invention is made and put in the public domain, or (4) the inventor remains the proprietor but keeps the technology secret instead of patenting it". (Scotchmer 2004: 275) The difficulty with these definitions of patent value is that they are based on hypotheticals. For instance, a patent owner will never know what the private value of its invention would have been had it put the invention in the public domain. The same goes for the three other scenarios. Some researchers have however attempted to estimate patent value with the help of counterfactuals. In their study of patent citations as value indicators Harhoff et al. (1999) made patent owners estimate the smallest price with which they would have sold their patent in 1980 knowing then what they knew in 1996 about the profits generated by the patented invention. This asset-value approach helped the researchers estimate the discounted profits due to "having the invention *and* its accompanying patent protection" (ibid.).

In determining the use value of the patent to the patent owner, both the value of the patented invention and the patent right matter as both affect the payments that can be gained by holding the patent (Gambardella et al. 2006). The value of the patented invention is equal to the payments that can be gained in sum by market players by implementing the invention whereas the value of the patent right describes the payments the patent owner can gain by holding the exclusive right to the invention. In case of licensing, the value of the patented invention can be seen as the sum of the use values the invention brings to licensees and the value of the patent right reflects the payments the patent owner can gain by holding the patent to the invention. Thus, for a patent to be valuable to a licensor, it needs to protect a valuable invention.

Both the value of the patented invention and of the patent right are affected by uncertainty (Lemley and Shapiro 2005). Commercial uncertainty affects how likely it is for the value potential of the patented invention to be reached whereas legal

uncertainty, which refers to the uncertainty about the validity and scope of the patent, affects the value potential of the patent right. Somaya (2012) refers to patents as "fuzzy" due to their inherent uncertainty and although patents are usually described as "rights to exclude" Shapiro (2003) suggests that they should be considered more as rights to attempt exclusion. "Roughly half of all litigated patents are found to be invalid" (Lemley and Shapiro 2005: 76) and even if the patents are found to be valid, there is still the question of scope, which needs to be interpreted case by case and can be interpreted differently by different judges.

2.2.2 PATENT USE

Patents can be used in different ways by different types of companies, but the two main ways to appropriate returns from patenting is to either commercialise the patented invention and use the patent as a shield to block copying or to monetise the patented technology by licensing and profit with royalties (Cohen et al. 2000). These main use cases stem directly from patent law as patents are rights to exclude. A patent owner can either prohibit others from using its patented invention and thus profit from its market power or it can profit by selling licenses to the technology and thus profit from sharing this power.

Although industry is criticised as an explanatory factor by Rumelt (1991), industry and field of application remain important aspects to consider when analysing patent use. An important question is to look at the scope of the patent in relation to the product or process it is implemented in. In industries where patents cover entire inventions, such as the chemical or pharmaceutical industries, patents are especially important for appropriating back the value created with years of R&D. However, in industries with complex products patents can cover only an incremental part of a product in which case patents may be needed for e.g. cross-licensing deals. (Somaya 2012) In some of these industries patents may be used for developing standards and this can limit the way in which patents can be used in licensing for instance. Patent contributing firms may be required to sell licenses to all willing buyers with fair, reasonable and non-discriminatory terms (as is the case with many cellular standards) or the companies may have decided to offer the use of their patented inventions for free by giving out licenses (as is the case with Bluetooth).

Patents are owned and used by different types of companies, which impacts their use. In general, patent owners fall into two categories: practicing and non-practicing

entities (NPEs). Practicing entities are vertically-integrated manufacturers that use their patented inventions in their own products or processes and can therefore use the patent for both commercialisation and licensing. Some NPEs on the other hand hold only the right to the invention and can thus appropriate returns only with licensing or other means than commercialisation. In literature and in public discourse, NPEs are often referred to as "patent trolls" (e.g. Fischer and Henkel 2012; Lemley 2008; Reitzig et al. 2007) due to their attempts and ability to hold-up or add costs to firms implementing their patents.

Although commercialisation and monetisation by licensing are listed here as the two main use cases of patents, patents like so many other assets can be traded and transferred among firms. The transfer of patents can occur in mergers and acquisitions or they may be sold separately. The original owner may not always be the best in profiting from its invention or understanding all the ways in which it could be used (Scotchmer 1991) and in these cases selling the patent can be more profitable than holding it. Monetisation can therefore occur also in the form of patent sales.

2.2.3 PATENT MANAGEMENT

Patent management can be seen as the set of activities and resources that support the creation and appropriation of the value of the patent right. Reitzig and Puranam (2009) study these capabilities in the context of patent filing, an early activity in the so-called IP value chain (figure 3), which consists of three IP related activities: IP generation, IP protection and IP utilisation. The first activity, IP generation, is an upstream activity consisting of research and development efforts that generate patentable inventions and is described by the researchers as the value creating activity in the value chain. The following activities, IP protection and IP utilisation, are downstream activities concerned with value appropriation and contain the activities that form the patent management capability of the firm.

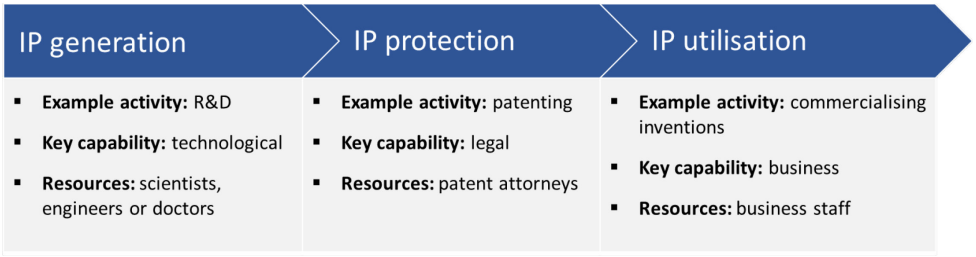

Figure 3: IP value chain (based on Reitzig and Puranam 2009)

Somaya (2012) refers to the different activity domains of patent management as "rights", "enforcement" and "licensing" (figure 4). The first activity domain, rights, consists of the different activities involved with building and maintaining a firm's patent portfolio. Depending on the firm, it can include patenting inventions by the firm or the purchase of patents from other firms as well as the decisions to renew or discontinue patents in the portfolio. Enforcement is defined by Somaya (2012: 1089) as the "use or threatened use of litigation to stop [use of] patented inventions or to [get an infringer to] pay royalties" and described as a "potentially […] expensive multi-stage game". In this thesis, rights and enforcement form the IP protection activity in the IP value chain. Of the two, rights describe more the administrative activities occurring in an IP organisation whereas some patent enforcement activities such as litigation can be more incidental.

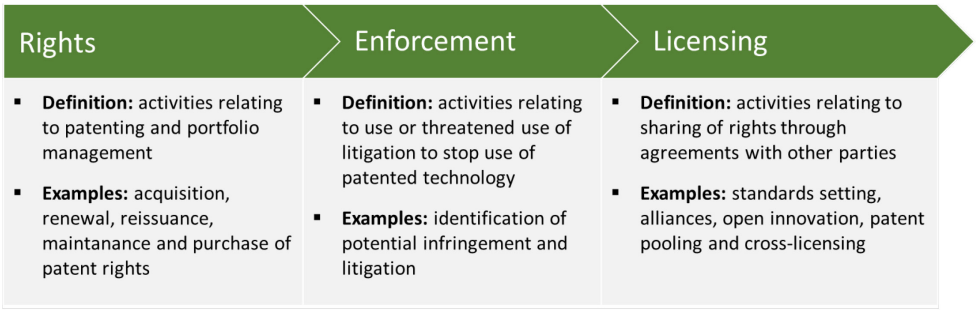

Figure 4: Patent management activities by Somaya (2012)

The third activity domain, licensing, refers to the activities involved with the sharing of patent rights through agreements. Depending on the industry and patent strategy of the firm, it can involve activities relating to e.g. cross-licensing, standard setting, open innovation or patent pooling. (Somaya 2012) Overall, it involves activities such as the identification of potential licensees, which can be an activity shared between licensing and enforcement, as well as the negotiation of agreements and the development of the firm's licensing program (Smith and Parr 2005).

In this thesis, licensing is part of the IP utilisation activity in the IP value chain, which includes also the activities involved with the commercialisation of patented inventions by implementing them in products or processes. In a simple case in which one firm licenses the use of its patented technology to another, implementation can be regarded as the final stage in the IP value chain and would consist of activities by the licensee. In figure 5, the activity domains described by Somaya (2012) and Reitzig and Puranam (2009) are combined to form the basic structure of the IP value chain in patent licensing. The activity domains coloured green (rights, enforcement and licensing) form the patent owning firm's patent management capability.

Figure 5: Activities in the IP value chain in patent licensing context

The different patent management activities call upon at least three distinct underlying capabilities: technological, legal and business capabilities (Reitzig and Puranam 2009; Smith and Parr 2005). Technological capability is needed especially in IP protection activities and is provided by engineers from the research and development function and patent attorneys specialised in the technical-legal questions related to patenting, patent maintenance and enforcement (Reitzig and Puranam 2009). Legal capability is required in all the three patent management activity domains and is provided by patent attorneys and lawyers specialised in e.g. patent law, litigation or drafting of agreements. Business capability is needed on the other hand especially in the IP utilisation activities where business development activities (e.g. analysing markets and business opportunities) or licensing (e.g. negotiating deals, determining royalties) are involved. (Ibid.; Smith and Parr 2005)

For an organisation to execute all the activities in the IP value chain (figure 5), all three capabilities (technological, legal and business) need to be at the firm's disposal. In addition, effective patent management entails both specialisation and coordination of tasks among experts from different specialised activities in the IP value chain. Reitzig and Puranam (2009) find in their study on patenting outcomes that the speed at which firm's get patents granted is affected by the level of functional specialisation of firm's activities throughout the IP value chain and that the functional specialisation effect is inversely U-shaped: specialisation and

specialised experts from different capabilities (technological, legal and business) as well as coordination are required to get patents granted fast. Both lack of specialisation and, on the contrary, lack of coordination lead to slower patent grants.

2.2.4 GENERIC PATENT STRATEGIES

Patent owning firms follow mostly three generic patent strategies that are based on their focus of appropriating returns from patents (commercialisation or monetisation) and the differences in the firms' strategic contexts. The generic strategies are *the proprietary strategy*, *the defensive strategy* and *the leveraging strategy*. The proprietary and the defensive strategies are pursued by practicing entities who aim to appropriate value from their patents by commercialising patented inventions. The leveraging strategy on the other hand is built around monetisation, typically in the form of licensing and is the generic strategy in focus in this thesis. (Somaya 2012)

The proprietary strategy is based on protecting strategically important inventions as tightly as possible and is perhaps the strategy traditionally thought of when considering patent use and value appropriation (Teece 1986). It is also referred to as the offensive strategy and based on proactively improving the patent owning firm's proprietary position by limiting competition in key technology markets. The proprietary strategy is usually implemented in technology spaces where individual patent owners can create patent fences around entire technological solutions and where close substitutes are few or difficult to come by. An example of an industry where the proprietary strategy is common is pharmaceuticals where new drugs are protected heavily to ensure a monopolistic position once they enter the market. (Somaya 2012)

The defensive strategy is a by-product of technology markets characterised by complexity and incremental innovation such as the telecommunications industry. Due to the high risk of hold-up, firms need to use patents to defend "against patents owned (and potentially enforced) by others" (Somaya 2012: 1093). When multiple technological inventions are involved in a single product and there are many firms with patents to these inventions, holding some of the patents levels the playing field – if another firm attempts to exclude others from the market, those with their own rights to exclude can impose a similar threat. In essence, the defensive strategy is

thus built around ensuring freedom of operation and the role of patents is to prevent lawsuits and to work as bargaining chips. (Ibid.)

The leveraging strategy aims to monetise patents typically through licensing as opposed to commercialising them and is pursued by firms when following a proprietary or a defensive strategy is either infeasible or unnecessary. For instance, a firm pursuing a leveraging strategy may lack its own manufacturing capability (as is the case with NPEs), the patents included in the strategy may cover technologies that are not central to the firm's product market strategy but be still valuable[2] or they can be easily invented around and therefore unfitting to a proprietary strategy. On the other hand, for instance due to holdup asymmetry[3], the firm may be able to leverage its patent position in licensing negotiations so as to make following a purely defensive strategy unnecessary. (Somaya 2012) In general, firms have incentives to pursue a leveraging strategy based on licensing if it enables them to capture a larger share of total profits in the market than by following a proprietary or defensive strategy (Arora and Fosfuri 2003).

Somaya (2012) refers to the high costs of the different patent activity domains (rights, enforcement and licensing as described in chapter 2.2.3) as he suggests that a patent owning firm ought to prioritise the activities based on the patent strategy the firm aims to follow. For instance, the costs of patenting differ by patent and by country but include at least the fees for the filing, examination, granting and prosecution of the patent, the costs for having a patent attorney work on the patent, the costs of translation and the maintenance fees paid during the lifetime of the patent. In Germany alone, these costs added up to approximately $32,000 based on estimates made in 2010. As patent protection is usually sought from several regions, the costs per a single patent family can rise to hundreds of thousands of dollars. The

[2] Rivette and Kline (2000) discuss these types of patents in their book *Rembrandts in the Attic*. They're notion is that firms should consider appropriating value from all of their patents, not just the ones currently valuable to them in their commercial products or processes, as some of the patents may for instance cover technologies that are valuable to other firms and that way be potentially valuable to the patent owner.

[3] Somaya (2012) refers to holdup asymmetry as one of the explanatory factors for a patent owning firm to pursue a leveraging strategy. In practice, holdup asymmetry occurs for instance when an NPE threatens manufacturers with patent enforcement to generate licensing income. The asymmetry comes from the fact that the NPE has the potential to halt the manufacturers' production with court orders but cannot be threatened with similar actions by the manufacturers if it doesn't operate in the product market.

costs of litigation differ by country as well, ranging from tens of thousands of dollars (e.g. in Germany) to millions of dollars (e.g. in the United States) and being higher the larger the damages involved. (Park 2010) On top of the costs of patenting and maintaining a portfolio and enforcement, transaction costs which are part of licensing and other organisational costs such as the time of company employees from other functions than patent management need to be considered to get an overall view of the costs of patent management (Somaya 2012). The main characteristics of the three generic patent strategies and how these affect the approach taken in the different activity domains are condensed in table 1.

Table 1: Activities in generic patent strategies (based on Somaya 2012)

	Generic patent strategies	Proprietary strategy	Defensive strategy	Leveraging strategy
Background	**Use of patents**	▪ Patents used to protect own invention	▪ Patents used to ensure freedom to operate	▪ Patents used to profit from other firms' willingness to use patented technology
	Strategic context	▪ Value appropriation through commercialisation of patented technology ▪ Patented invention of high strategic importance to patent owning firm ▪ Patented invention with few close substitutes	▪ Value appropriation through commercialisation of patented technology ▪ Complex technologies involving multiple patented inventions ▪ High risk of patent holdup	▪ Value appropriation through monetisation of patent rights ▪ Proprietary and defensive strategies infeasible or unnecessary due to e.g. holdup asymmetry or ease of inventing around
Activities	**Rights** *(activities relating to patenting and portfolio management)*	▪ High emphasis on patenting quality and quantity to ensure exclusive coverage of invention	▪ Defensive patenting by building large portfolios including different technologies for bargaining purposes	▪ Focus of protective activities on those rights with demand in the market
	Enforcement *(activities relating to use or threatened use of litigation to stop use of patented technology)*	▪ Active efforts to detect infringement ▪ Aggressive efforts to enforce one's rights	▪ Willingness to settle cases where mutual holdup ▪ Challenges of others' patents and invalidation suits	▪ Threat of litigation used to create demand for patent licenses
	Licensing *(activities relating to sharing of rights through agreements with other parties)*	▪ Unwillingness to license typical	▪ Cross-licensing and patent pooling typical	▪ Licensing usually main appropriation mechanism
	Example firms	*Pharmaceutical companies*	*Telecom companies*	*Non-practicing entities*

In the proprietary strategy, the general emphasis is on IP protection activities. Money, time and effort is invested in building as "watertight" a shield as possible around strategically important inventions and enforcement is built around detecting and blocking infringement. Licensing patented technologies is not in focus in the proprietary strategy and may not be a required function (as in the defensive strategy) due to the strength of protection and in the case of a lack of close substitutes to the patented invention. (Arora and Fosfuri 2003; Somaya 2012) As in the proprietary strategy, in the defensive strategy emphasis on IP protection is high. However, in the defensive strategy licensing plays a key role as other firms' possibility to halt production through litigation needs to be overcome with agreements. (Shapiro 2000; Somaya 2012)

In the leveraging strategy licensing is the key activity with the other activity domains built around it. When other activities are built around the licensing function, as in the leveraging strategy, the rights and enforcement activities are organised around creating demand for license agreements. (Somaya 2012) This suggests maintaining the patent portfolio based on other firms' needs for the patented technologies instead of only on one's own and using the threat of litigation to generate demand for patent licenses and to get other firms to pay royalties for implementing patented technologies. Although NPEs have been studied a lot as examples of firms operating by the leveraging strategy (e.g. Reitzig et al. 2007; Reitzig et al. 2010), the work of Arora and Fosfuri (2003) suggests that also firms competing in the product market and conducting R&D can pursue a leveraging strategy and thus build their patent management with a licensing focus.

2.3. VALUATION MODELS FOR LICENSING

In this thesis, value appropriation occurs in the context of licensing where patent value is realised through the exchange value of patent licenses. In this chapter, general patent valuation models used for licensing are first discussed after which the strategic valuation model describing factors impacting license prices is presented. The model serves as the basis for analysis in the empirical part of this thesis and is the foundation for linking different activities and resources from the patent management capability to patent licensing outcomes.

2.3.1 LICENSING VALUATION METHODS

Patent value can be realised in different situations where patent valuations are required. Patent valuations are needed for firm-external reasons for instance in determining damages in an infringement suit, in licensing negotiations, in mergers and acquisitions, in bankruptcies, in collateral-based financing for loans, in determining relative ownership in alliance formation or for taxation purposes in intercompany transactions (Smith and Parr 2005: 7-8). Also, patent valuations may be conducted internally for portfolio management purposes (e.g. Reitzig 2004) or by economists researching the functioning of the innovation system (e.g. Scherer and Harhoff 2000). As the focus in this thesis is on licensing negotiations, licensing valuation methods will be discussed in more detail. In their review of literature Lerner and Layne-Farrar (2006) discuss five basic licensing valuation methods:

rules of thumb, the cost method, the market method, the discounted cash flow method and options pricing methods.

The purpose of the different licensing valuation methodologies is to determine a price or use value for a patent license. How the payments to pay for the license are structured can however be implemented in different ways. The agreement could include an upfront payment, royalty payments or both and might also be arranged to include equity or milestone payments. A lot of literature emphasises the use of upfront payments but their use in practice can be difficult; for instance, how to come up with a fair price that considers the commercial uncertainty related to the patented technology? Therefore, upfront payments are often accompanied or replaced with royalty payments which mitigate the uncertainty for both the licensor and the licensee. (Lerner and Layne-Farrar 2006) In practice, "patent licenses usually involve a combination of pricing terms" (ibid.: 13). For simplicity, the different payments are lumped here together and referred to from now on as the price of the license.

Rules of thumb or heuristics have been used widely in licensing negotiations (Lerner and Layne-Farrar 2006; Goldscheider, Jarosz and Mulhern 2005). The most famous rule of thumb is the Goldscheider rule (also known as the 25% rule) which suggests that the “licensee pay a royalty rate equivalent to 25% of its expected profits for the product that incorporates the intellectual property at issue” (Goldscheider, Jarosz and Mulhern 2005: 410). Another rule of thumb type method is the cost method which estimates the price of a patent by adding an arbitrary profit margin to the cost of developing and patenting the underlying invention. Valuation heuristics have been criticised for over-simplifying patent valuation (Lerner and Layne-Farrar 2006) and discredited in court for damages calculations (Uniloc USA, Inc. vs Microsoft Corp. 2011 on the 25 % rule). Importantly, they ignore the private value of the patent right and disregard the fact that patent values aren’t normally distributed but highly skewed (ibid.; Scherer and Harhoff 2000; Pakes 1986). They also ignore how licenses are used in practice and what the relative bargaining powers of the parties in the negotiation are (Lerner and Layne-Farrar 2006).

The market method anchors the range of possible prices for a patent with information of agreements on similar technologies (Lerner and Layne-Farrar 2006). It can also be referred to as the comparables method. The idea behind the market method is relatively sound and the method is in theory simple to use. However,

benchmarking patent prices is challenging for two main reasons: information on license agreements and paid prices for patents are usually not publicly available and the identification of non-clouded comparable agreements is difficult. (Ibid.; Smith and Parr 2005: 669-674). When a license agreement on a similar technology is available, many aspects of the "agreement must be analyzed for the royalty provision to be a useful proxy" (Smith and Parr 2005: 674). For instance, independence and bargaining powers of the negotiating parties need to be assessed before accepting the agreement as a proxy (ibid.: 669-674). Possibly due to the challenges of finding true comparables, the market method has been applied loosely using industry average royalty rates as proxies. However, using such averages for anchoring a price is similar to using another rule of thumb: the method is fairly simple to apply but crude and risks leaving money on the table. (Pitkethly 1997)

The discounted cash flow method is a type of income method which looks at patent price as the present value of the future stream of payments resulting from licensing the patent. The method attempts to estimate the value added by the patented invention in products or processes, which makes the method theoretically sound but less straightforward to use than the market method or rules of thumb. (Lerner and Layne-Farrar 2006) "Separating the value added by an invention, as opposed to other factors affecting sales and profitability, can be quite difficult" (ibid.: 10). This can be especially challenging with complex technologies were multiple patented inventions provide a specific function. Also, as the portion of payments accountable to the patented invention is an exogenous variable in the method, DCF suits the explanation of factors impacting the price of a license poorly.

Options pricing methods are income methods similarly to the discounted cash flow method. At their core, they are "permutations of the basic DCF methodology" (Smith and Parr 2005: 493). Options pricing methods include such methods as Monte Carlo simulations and the Black-Scholes solution. As valuation methods they are more complex than the ones discussed earlier but their advantage is that they consider the uncertainty related to patent value. (Lerner and Layne-Farrar 2006) Their challenge lies in their inputs and assumptions. For instance, the Black-Scholes solution assumes log-normal distributions for the underlying asset (Black and Scholes 1973), which is unlikely in the case of patent licensing. In addition, the Black-Scholes solution in its original form also disregards the bargaining powers that are likely to affect the exchange value of a patent license (Denton and Heald

2003). Although the Denton Variation of Black-Scholes (ibid.) aims to consider these bargaining powers, it still lacks consideration of the clearest alternative to licensing to a potential infringer: litigation.

Each of the valuation methods have their limitations and as information about the intrinsic value of a patent is usually far from perfect, the price of a license is "thus the result of a negotiation, rather than agreement on a calculation" (Bidault 1989: 50). On top of this, the valuations conducted on each side of the negotiation may reflect the differing interests of the negotiating parties (Smith and Parr 2005: 518-523). The patent owner wishes to maximise the value of its patent and perhaps gain back its heavy R&D investment whereas the infringer or potential licensee wishes to minimise the price it has to pay for using the patented invention in its products or processes. As the sides are likely to differ in their interests and their initial demands for what the price of a license should be based on their own valuations, negotiating is required to come up with a price both parties can agree on. The strategic valuation model, represented in the next chapter, considers the roles of negotiation under the threat of litigation and uncertainty in determining exchange values for patent licenses. As a game-theoretic model, it is limited in practical use by its requirements for data, but as a theoretic model it is assumed to depict the factors impacting payments to be gained with licenses better than the valuation models described in this chapter.

2.3.2 STRATEGIC VALUATION MODEL

The strategic valuation model represents the context in which a firm aims to realise the value of its intellectual property through licensing. The model considers many of the key aspects from literature that have to do with determining the exchange value of a patent in a licensing context such as uncertainty and bargaining power and acts as the starting point for the interviews described in chapter 3. It assumes that the determined price of a patent license is the result of a negotiation and can thus be modeled with game theory. The model represents the function of the exchange value of a patent license which depends on the use value of the patented technology to the licensee. It depicts only a portion of the private value the patent brings to its owner but is an important starting point for analysing how patent management as a capability can be built around appropriating value through licensing.

The strategic valuation model presented here is an adaptation of the model of Shapiro (2010). In the model, two firms, a patent owner (the plaintiff) and a potential infringer (the defendant), take part in an infringement dispute that leads to a negotiation on a license fee (referred to as price of the license). The parties are assumed to be rational, cost-minimising players with imperfect but symmetric information on the factors impacting the negotiation.

For simplicity, the patent owner is assumed to be a non-practicing entity and the potential infringer a downstream manufacturer. The manufacturer has a productive asset that potentially infringes on the patent owner's patent. The discounted cash-flow from the manufacturer's asset is denoted by π, $\pi > 0$ and reflects the use value of the patent to the manufacturer. For the patent owner, whom this thesis focuses on, π is assumed to be an exogenous variable as it depends on the capabilities and business circumstances of the manufacturer.

The licensing negotiation takes place in the shadow of litigation: the patent owner has the option of taking the patent implementor to court due to infringement if a settlement cannot be reached. The strength of the patent is probabilistic as described in chapter 2.2.1. If the firms litigate and the litigation leads to a judgement, the plaintiff will win and the court will find the patent valid and infringed with probability θ, $\theta \in [0,1]$. Accordingly, the defendant will win with probability $1 - \theta$. The defendant wins if the court finds the patent invalid or the technology in question to be outside the scope of the claims of the patent. In case the plaintiff wins, the legal remedy considered is an injunction. The losing side is assumed to pay the total costs of litigation[4] c, $c > 0$.

As rational, cost-minimising players, the parties prefer to avoid the costs of litigation. Thus, they settle out of the court and negotiate on a license fee. The negotiation follows Rubinstein's strategic bargaining where the threat points are pinned down by the expected court outcomes. The bargaining power of the patent owner is denoted by β, $\beta \in [0,1]$ and the manufacturer by $1 - \beta$. The bargaining powers refer both to licensing negotiations in the settlement phase as well as

[4] The assumption is based on the English rule used in European countries and many other jurisdictions in the world (Eisenberg and Miller 2013).

following judgement from trial. In the negotiation each side may make a take-it-or-leave-it offer by probability equal to its bargaining power.

The negotiation is the result of a game illustrated by the game tree in figure 6. First, the patent owner who has noticed potential infringement decides whether to approach the manufacturer with a notice of infringement and ask for a license fee. Sending of the notice starts the negotiation. Second, if the parties do not settle out of court, the patent owner has to decide whether to litigate. If the patent owner decides to litigate, a trial takes place. The negotiated price of the license p is solved backwards from the game tree by looking for subgame perfect equilibria.

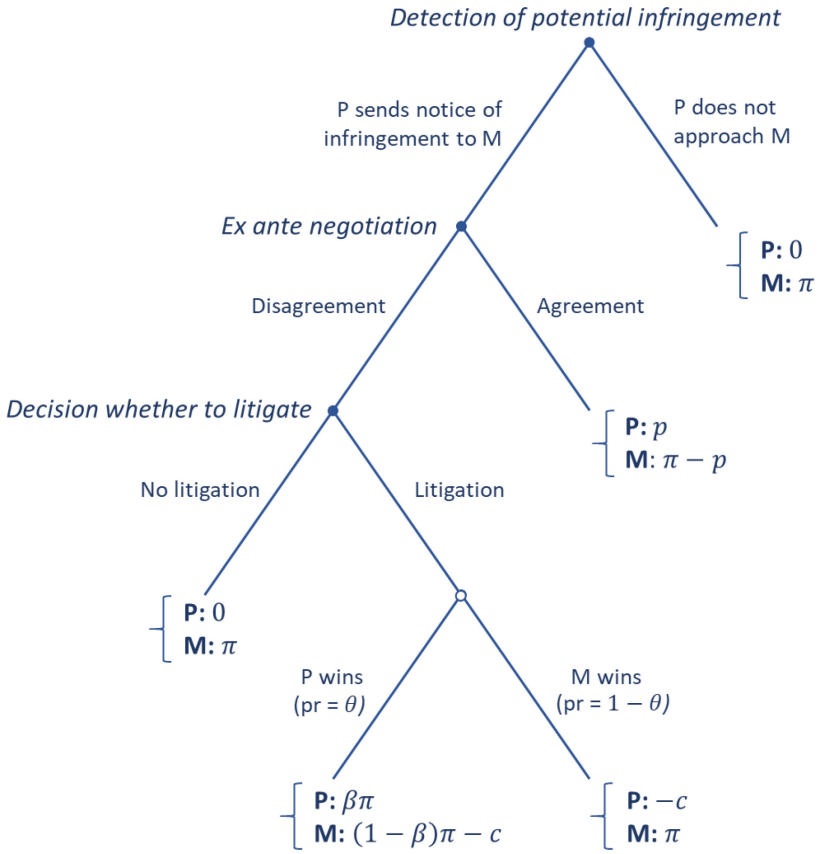

Figure 6: The game tree

If the parties go to court, the manufacturer will win with probability $1-\theta$ in which case the manufacturer will keep π and the patent owner receives nothing and has to pay the costs of litigation c. With probability θ the patent owner wins and the court order an injunction. In subsequent licensing negotiations, with probability β the patent owner will be able to extract royalties equal to π whereas with probability $1-\beta$ the patent owner receives no royalties. The expected licensing revenue to the

patent owner is therefore $\beta\pi$ and the expected remaining cash-flow to the manufacturer $(1-\beta)\pi$. Since the manufacturer lost the case in court, it has to pay the total costs of litigation c. As the patent owner was expected to win with probability θ, the expected payoffs from going to court for the patent owner and the manufacturer are:

$$\begin{cases} \text{P: } \theta\beta\pi - (1-\theta)c \\ \text{M: } (1-\theta\beta)\pi - \theta c \end{cases}$$

To ensure that the threat of litigation is credible, it is assumed that on expected terms going to court is profitable for the patent owner, i.e., $\theta\beta\pi - (1-\theta)c > 0$. As $c > 0$, the three other parameters must also be strictly positive. Although going to court is profitable to the patent owner, the parties prefer to settle out of the court because of the positive litigation costs c. Therefore, a trial never takes place in equilibrium. This is in line with empirical findings that indicate that only a small fraction of patent cases is actually litigated (e.g. Lanjouw and Schankerman 2001).

In the out-of-the-court negotiation, the patent owner proposes a license price p_P which makes the manufacturer just indifferent between going to court and coming up with an agreement. Thus, p^P must satisfy the condition $\pi - p = (1-\theta\beta)\pi - \theta c$, which yields $p^P = \theta\beta\pi + \theta c$. Accordingly, the manufacturer's proposal p^M must make the patent owner indifferent between going to court and accepting a license price. Thus, $p^M = \theta\beta\pi - (1-\theta)c$.

The patent owner's expected payoff is given by

$$\begin{aligned} p^* = \beta p^P + (1-\beta)p^M &= \beta(\theta\beta\pi + \theta c) + (1-\beta)(\theta\beta\pi - (1-\theta)c) \\ &= \theta\beta\pi - (1-\theta-\beta)c \end{aligned}$$

which is also the price predicted by the model. The exchange value of the patent license depends therefore on the use value of the license to the manufacturer (π), case strength (θ), and the bargaining powers and costs of litigation of the negotiating parties (β, c). In other words, the licensing outcome is impacted by the use value of the patent, the expectations regarding litigation and the capabilities impacting the bargaining positions of the negotiating parties. What the model presented here does not explain, is what impacts these parameters in practice and which activities and resources should patent management focus on to appropriate value from patents

through licensing negotiations. For this purpose, patent management experts were interviewed and the methodology and findings are described in chapters 3 and 4.

2.4. SUMMARY OF FINDINGS FROM LITERATURE

Following the logic of the resource-based view (RBV) presented in chapter 2.1., patent management can be analysed as an organisational capability which consists of organised activities that call upon internal or external resources and other capabilities to achieve a target outcome. In this thesis, the target outcome is that of value appropriation from patents by licensing. Patents on the other hand, can be regarded as intangible assets, which can be valuable to their owner but the value of which is affected by both commercial and legal uncertainty (Lemley and Shapiro 2005). Their use value to the patent owner depends on the commercial significance of the technological inventions they cover and on their properties as intellectual property rights (their scope and validity) as well as on the complementary assets and actions of the patent owner.

Based on Bowman and Ambrosini's (2000) definitions of value creation and value appropriation, value appropriation in patent licensing can be analysed as the patent owning firm's ability to capture the exchange value of the patent license. Key factors contributing to the exchange value of the license, which is the same as the price of the license, were summarised with the strategic valuation model, which was based on work by Shapiro (2010). The model, which depicts a pure patent licensing negotiation with a patent owner and a potential implementor, highlights four factors that a patent owning firm should consider when deciding whether to participate in and how to prepare for licensing:

- the use value of the license to the potential implementor (referred to as *discounted cash-flow from asset*),
- the legal strength of the patent owner's case if it needs to be taken to court (referred to as *case strength*),
- the bargaining position of the patent owner in terms of its relative capabilities compared to the potential implementor (referred to as *bargaining power*) and
- *litigation costs* which both negotiating parties are assumed to want to avoid paying.

The strategic valuation model portrays the factors as given, but does not link them to specific activities or resources outside the negotiation. On the other hand, activity domains relevant to patent licensing were identified from literature that were not linked to individual licensing negotiations and their outcomes. Patent management was recognised to consist of three activity domains referred to by Somaya (2012) as *rights*, *enforcement* and *licensing*. These form the IP protection and utilisation activities of the patent licensor's IP value chain (based on the concepts of Reitzig and Puranam 2009). From the patent licensor's perspective, the protective activities in the rights domain could be focused on patents covering technologies with commercial demand in the market and license demand could be generated with patent enforcement through the threat of litigation. In addition, the detection of infringement is expected to be also an activity contributing to patent licensing as it could be used to detect potential licensees and that way demand in the market.

To bridge the gap between the theoretic factors contributing to licensing outcomes and the activity domains forming patent management, interviews with patent management experts were conducted. With these interviews practical factors explaining license price formation as well as activities and resources impacting these factors were identified. The interviews and their findings are discussed in the following chapters.

3. METHODOLOGY

To analyse the factors that impact value appropriation in patent licensing negotiations, a strategic valuation model was formed (described in chapter 2.3.2) and 13 interviews with patent management experts were conducted between June and August of 2017. The interviews were used to explain practical issues impacting the theoretical factors contributing to license price (depicted by the strategic valuation model) and to fill a framework (consisting of the factors contributing to license price and patent management activity domains identified from literature) to answer the research questions of the thesis. In this chapter, the main focus is in describing the methodological choices of the empirical part of the study: the methods for the interviews and their analysis are discussed in chapters 3.1-3.3. The methodology for answering the research questions, based on both findings from literature and from interviews, is then discussed in chapter 3.4.

3.1. DATA GATHERING

The purpose of the data gathering was to get insights on factors impacting value appropriation in patent licensing (the theoretical factors are given by the strategic valuation model described in chapter 2.3.2) from patent management experts with broad experience in the field. Semi-structured interviews were chosen as the research method to support the descriptive nature of the study and for the benefit of choosing interviews over questionnaires, in this case, as well as to help with the analysis.

3.1.1 SAMPLING

The sampling was purposive to reach interviewees with significant professional experience with patent management related issues. As patent use and the role of licensing differs across firms (see chapter 2.2.2), different types of firms and their representatives were sent an invitation to be interviewed (one invite / representative per firm). Patent owning firms that were expected to follow rather strict proprietary strategies, such as pharmaceutical companies, were not contacted due to the low expected emphasis on licensing. However, some of the interviews included answers indicating proprietary strategies and were included in the study as they included also important information regarding licensing and for instance of being the target of licensing-focused firms.

To get face-to-face interviews and therefore for convenience reasons, the invites were sent to representatives of mostly Finnish companies residing in Finland. To gain a comprehensive, descriptive outlook on patent management factors impacting licensing, interviewees were recruited from two different perspectives to patent management: the strategy perspective represented by managers of patent owning firms and the activity perspective represented by consultants of patent services providing firms (figure 7). This was based on the rational that the managers would have a broad look of the implementation of different activities as part of distinct patent strategies in the context of the firm or industry they represented whereas the consultants would have been more focused on distinct activities but serving a wide range of firms, industries and different patent strategies. Of course, the interviewees could have experience from both being a manager and a consultant (as was also the case with at least one of the interviewed consultants).

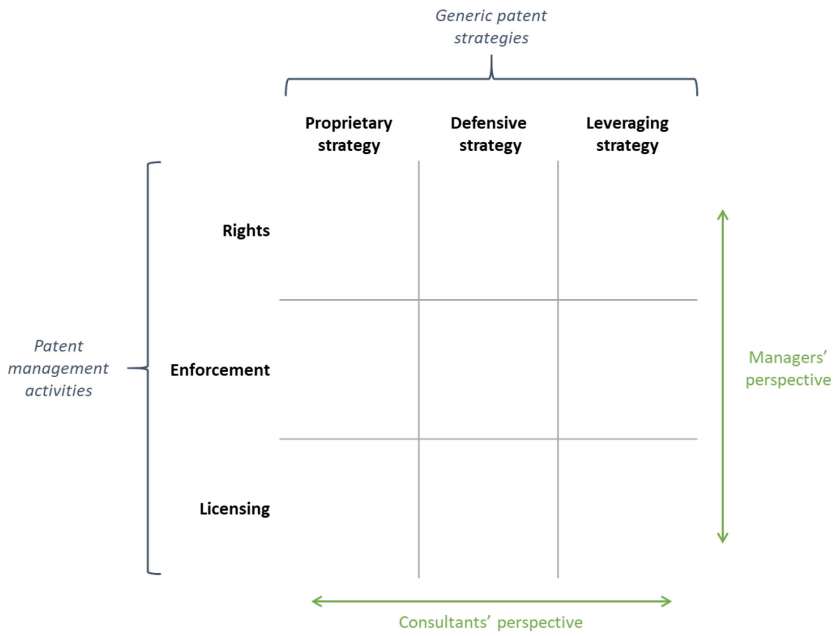

Figure 7: Interviewees' expected perspectives on patent management (based on constructs described in chapter 2.2)

Seven of the 13 interviewees were managers from different patent owning firms, all but one working at the firm at the time of the interview and one having worked for the firm within a year from the interview. The managers were either heads of their units, heads of the IP team, heads of licensing or the person responsible for IP related activities in their company. The companies discussed represented different industries, different entity types (manufacturers, NPEs or both) and implemented

different generic patent strategies. They had also patent-portfolios of different sizes. In the sample, the firms that aimed to monetise their patents also operated as NPEs for the part of the portfolio that they aimed to monetise. The other firms used patents mainly to support the commercialisation of their products or processes. However, also these firms had background with licensing efforts, both as licensors and licensees. (Table 2) The rest of the interviewees were consultants from companies providing patent related services. The companies they worked for focused on different patent management activities: patenting related patent-technical issues, legal questions related to patents (especially litigation and contractual issues) and patent use and strategy related questions. (Table 3)

Table 2: Background information of interviewed managers

	Manager	M1	M2	M3	M4	M5	M6	M7
Interviewee	**Title**	VP, Head of Patent Business	Director, IPR	Director, IPR	Managing director	Director, IPR	Manager, IP and research	VP, IP
	Background *(based on degree)*	Law	Technology	Technology	Technology	Technology/ Business	Technology	Technology
	Years of experience	20+	20+	15+	15+	10+	20+	15+
Company information	**Approximate portfolio size** *(patent families)*	20 000+	1000-2000	500-1000	500-1000	50-100	100-250	25-50
	Entity type *(NPE/manufacturer/divided)*	Divided	Manufacturer	Manufacturer	NPE	Manufacturer	Manufacturer	Divided
	Main use of patents *(commercialisation/ monetisation/divided)*	Divided	Comm.	Comm.	Monetisation	Comm.	Comm.	Divided
	Pure patent licensing *(yes/some/no)*	Yes	Some	No	Yes	No	Some	Yes
	Commitments	FRAND (SEPs)	-	-	FRAND (SEPs)	-	Free use (SEPs)	-
	Infringement claims *(target/targeter/both; common/some/none)*	Both; common	Both; common	Targeter; common	Targeter; common	Target; some	Target; common	Targeter; common*
	Litigation *(active/common/rare)*	Active	Common	Rare	Active	Rare	Common	Common*

Table 3: Background information of interviewed consultants

	Consultant	C1	C2	C3	C4	C5	C6
Interviewee	**Title**	Partner	Managing director	CEO	Partner	CEO	Partner
	Background *(based on degree)*	Law	Technology	Business	Law/Technology	Technology	Law
	Years of experience	15+	15+	20+	20+	20+	15+
Company information	**Type of consultancy**	Law firm	Patent agency	Management consulting firm	Law firm	Patent agency	Law firm
	Focus of firm *(patent management activities)*	Licensing, contracts, litigation, dispute resolution, transactions	Patent drafting, prosecution, strategy	Transactions, licensing, strategy	Transactions, licensing, dispute resolution, strategy	Patent drafting, prosecution, strategy	Transactions, licensing, litigation, strategy

The academic backgrounds of the interviewees were mostly from the fields of technology or law (some having degrees in both). One of the consultants had graduated with a business degree and at least one of the managers had done an MBA. All had extensive professional experience with patent-related issues, ranging from over 10 to over 20 years at the time of the interviews. (Tables 2 and 3)

3.1.2 DATA COLLECTION

Vuori (2018) mentions the richness of information gathered and the possibility to add questions during the data gathering process (if something in the answers wasn't clear or if an interesting point would be raised by an interviewee) as benefits of conducting interviews with open-ended questions as opposed to using e.g. a static questionnaire. Based on discussions with former colleagues of some of the interviewees, it was also expected that it would be easier to get the experts to answer questions by booking an interview with them than by asking them to fill out a questionnaire. The possibility to modify the questions if the original wordings could be noticed not to be working based on the interviewees' responses was also seen as a benefit for using interviewees over questionnaires. To help with the analysis and comparison of what factors were discussed in each interview and to enable quantification of mentions in the data, the interview guide was structured (appendix 1) and the interviews overall conducted following a semi-structured approach.

As Vuori (2018: 67) points out, "highly educated managers as interviewees are not naïve". Thus, the questions in the interviews were posed so that they recognised the expertise of the interviewees (e.g. not asking questions about basic elements of patent law but stating them before discussing the question needed to be answered) and were aimed at making the interview conversational (e.g. in the interviews with more time or in which the main questions in the interview guide would be gone through promptly, additional topics would be discussed referring to literature or factors raised from prior interviews). To avoid leading the interviewees, the main interview questions were ordered by topic so that broader questions would start each topic to get each interviewee's initial response to particular themes before going into more specific questions on factors already thought of by the interviewer.

As all interviewees as well as the interviewer were Finnish, the interviews were conducted in Finnish. Most of the interviews were held in company premises of the interviewees apart from two interviews which were conducted on the phone due to scheduling challenges. All of the interviews were recorded and later on transcribed word-for-word. As the focus was on manifest content (the themes and points that were mentioned by the interviewees), latent content described by Elo and Kyngäs (2008) as e.g. laughter or long pauses were not included in the transcripts.

The number of interviews was sufficient to reach saturation as each main point that was strictly related to the factors of the strategic valuation model was mentioned by at least two interviewees and no relevant new information for the general understanding of the patent licensing context came from the last interview. However, some context and discipline specific points concerning licensing-focused patent management were made by individual interviewees which were discussed to broaden the general understanding of the writer of patent management related issues and to inform the analysis linking identified factors contributing to patent management to aspects of patent management.

Each interviewee was asked whether their name and the name of the firm they worked for could be mentioned in the thesis. All but one agreed to this - however, two legal consultants wished to highlight that the points they made during the interview were theirs and shouldn't be portrayed as representing the views of the firm they work for. As such, the interviews were, a part from one, conducted with the assumption that the interviewee names and firms would be published as part of the study. However, as one interviewee didn't want this information to be made public, it was afterwards decided that all interviewees would be referred to with pseudonyms.

The fact that the interviewees weren't promised anonymity probably impacted some of their answers regarding their companies and may have impacted the level in which the interview topics were discussed. However, as the aim of the interviews was to get a descriptive view of factors impacting licensing, and not to necessarily test theory, and it was expected that sensitive information regarding prior or ongoing cases would not be discussed by the interviewees, this shouldn't have compromised the results and the data should be sufficient in its level of detail to enable answering the research questions.

3.2. INTERVIEW GUIDE

3.2.1 STRUCTURE AND FORMULATION

The interviews were conducted using two versions of a semi-structured interview guide. The first version of the guide (appendix 1) was used for the interviews with the managers and a modified version of this guide was used for the interviews with the consultants. The main differences in the two versions have to do with the

background questions and the point of view when discussing patent use: managers are asked about their own business whereas consultants are asked about what they've come across when working in the market for their clients. As managers are asked background questions about how their firms use patents, the consultants are asked about the types of patent management activities their firms focus on.

Due to the limited time for each interview, the interview guide focuses on patent management recourses in each firms' disposal and the *case strength* and *bargaining power* from the strategic valuation model (described in chapter 2.3.2). The discounted-cash flow from asset is an exogenous variable in the model, and was therefore not included in the interview guide. Litigation costs on the other hand were represented as significant in the literature and information on them could be found well online so they weren't included in the interview guide. The topic of litigation costs was included in the interviews with the consultants from law firms but not in the other interviews as it wasn't a topic that needed further information from all the interviewees to answer the research questions.

The interview guide was gone through with an expert in the field to see if there where relevant themes and questions missing and to get a sense before the interviews of what might be challenging to get answers to and how to word the questions so as to get answers. Based on this discussion and from discussions with other people with a patent management background as well as on findings from literature (Lerner and Layne-Farrar 2006; Smith and Parr 2005: 669-674), it was clear that the interviewees would be highly unlikely to discuss ongoing cases. Because of this, the questions focused on the general level of conducting patent management and licensing. As an example, instead of asking about particular cases, the interviewees were asked about typical cases when discussing their own business or the business of their clients.

The purpose of the interview guide was to give a similar structure to the different interviews and make sure that each theme would be covered in each interview. The questions were there to help the interviewer in case the interviewee would go off topic or the conversation wouldn't flow as planned. The questions could be phrased differently than in the guide, as long as the topics got covered. As the time to be used for each interview and the interviewees interests varied, certain topics were emphasised more in some interviews than in others. The topic that was dropped in some interviews due to time constraints was the description of the firm's typical

case. Based on experience from the first interviews, this was noticed to be least essential to the way the interviewees answered the other questions although it worked as helpful background information for analysing the interviews. A topic that was added in some of the interviews conducted later on was *which activities from the patent value chain could be outsourced*.

3.2.2 BACKGROUND QUESTIONS

The background questions were aimed at discovering from which angle the managers and consultants looked at patent management in their usual work to get a better sense of their answers. To understand better the way the patent management capability of each firm was formed and the importance of licensing to each firm, the managers were asked what the firms focused on in patent use (commercialisation or monetisation) and whether they were practicing entities (especially in those areas in which they focused on monetisation). Based on the strategic valuation model (represented in chapter 2.3.2), licensing was expected to be tightly linked to litigation, which was why background information with regards to legal cases were asked about. Experience with infringement claims were also asked about because they were assumed to be a usual start to licensing negotiations as well as a part of enforcement.

To understand the managers' firms' roles in licensing discussions, the interviewees were asked whether their firm was actively targeting other firms or whether the firm had experience with being targeted by licensors. The information regarding how common it was for the firms to take part in litigation was to see how experienced their firms were with litigation as background information for questions regarding case strength. Also, factors limiting the way in which patents could be used where looked for by asking whether the firm had any external commitments affecting its patent use such as being part of standards that obligate licensing with fair, reasonable and non-discriminatory (FRAND) terms.

The background questions to the consultants were aimed at identifying which patent management activities their firms focused on and which general capability (technical, legal or business) from literature they themselves represented (in relation to findings from literature in chapter 2.2.3). The consultants were also asked about their general clientele to get an understanding of whether their answers might be steered towards particular industries, patent strategies or company sizes.

3.2.3 THEMATIC QUESTIONS

To find out what resources and general capabilities were at the different firms' disposal, each interviewee was asked about internal resources (such as the number of employees in patent management functions, the level of specialisation of these individuals and whether the firm had a separate budget for patent litigation) as well as external resources in their firms' and, in the consultants' interviews, in their clients' firms' disposal (such as what is usually outsourced). It was assumed that the answers to these questions could be used as additional information for identifying which general patent strategies the firms pursued, to get a sense of the level of specialisation required by each activity in practice and to understand which resources and activities are required by a licensing-focused strategy and whether they should be invested in as internal resources or activities.

The questions regarding case strength were built around the assumption that important factors impacting case strength had mostly to do with patent strength – the uncertainty with regards to patent scope and validity. However, to recognise also other factors that in practice could affect the expectations in licensing negotiations concerning litigation the interviewees were asked what other factors might affect a patent owner's likelihood of winning a legal battle in court. Here, it was expected that litigation related resources and activities would be brought up. The remainder of the questions were built around what firms could with their own actions within individual negotiations and in anticipation to them (as part of the IP value chain) do to impact patent strength – to prove infringement and to enhance patent validity. In addition, detection of infringement was discussed as an activity as it seemed like a potentially important activity for patent management under a licensing-focused strategy for identifying potential licensees.

General questions about what the license price is based on and how royalties are determined were asked to see whether the assumptions of the strategic valuation model (e.g. of the price being the result of a negotiation) made sense in practice. Valuation related resources were also asked about based on the assumption that economic reasoning and thus business capability could be needed for coming up with a convincing and profitable pricing model for licensing.

The remainder of the questions were focused on bargaining power and the link between case strength and bargaining power. First, a broad question of what affects

the length of licensing negotiations was asked to get insights into factors impacting bargaining power but also to identify factors outside the strategic valuation model that ought to be considered or might be contradictory to the model. The assumption here was that quick negotiations would be at least partially explained by the patent owner's high bargaining power relative to the licensee and therefore factors speeding negotiations could be potential factors for bargaining power. After this, the interviewees were asked about the impact the business context in which the negotiating firms operate in would have on bargaining power or the price of the license (such as business dealings in other functions of the firms) as well as direct questions about potential factors such as differences in firm size. Lastly, the interviewees were asked about the link between case strength and bargaining power to see how tight the link was in practice and whether in practice they could be seen as separate issues.

3.3. ANALYSIS

The analysis of the interview data was conducted following the inductive qualitative content analysis process described by Elo and Kyngäs (2007). The inductive approach was chosen to support the descriptive nature of the study and to help bridge the studied but fragmented area of research. The interview transcripts were first open-coded after which first of them were transferred to coding sheets in Microsoft Excel. Based on the first batch of interviews, the open-coded concepts were grouped into themes, factors and subfactors and then combined to an analysis sheet to which the latter interviews were included directly as the top-level themes were already identified. As the transcripts were in Finnish, the concepts had to be translated for analysis. The translation was done by myself at the point in which each interview was included in the analysis file. If there was a risk of losing the initial point the interviewee had made in the coding and translation process, the concept was written in a longer form than the concepts that could be condensed and translated without risk of misinterpretation during actual analysis.

The analysis sheet was structured to depict the themes, factors, subfactors as well as examples or rationale from the interviews and to support quantification of the results. The basic structure of the analysis sheet is that each row depicts a particular viewpoint and the columns (7-19) depict separate interviews. The first column in the analysis sheet included the main topics covered in the interviews most of which

came directly from the interview guide (examples of topics include *validity* and *bargaining power*). The second column included the themes (such as *factors impacting patent validity*) and the third and fourth column included the factors and subfactors impacting or describing a particular theme. The fifth column included additional information and was used to help with remembering specific points or interesting rationales provided by interviewees referring to specific factors in the analysis sheet. Each theme, factor, subfactor and additional bit of information was written on separate rows so that mentions to each could be summed on the analysis sheet in column 6. A mention of a subfactor was included in the sum of the subfactor, its top-level factor as well as the theme it linked to. As some of the interviewees mentioned only top-level factors, the sum for top-level factors with particular themes could be higher than the sums for the subfactors within the themes.

Table 4 depicts the stylised summary table of the qualitative content analysis for theme *factors impacting patent validity*. The table includes information on factors identified from the interview transcripts, their subfactors if the top-level factors where summarising multiple factors as well as the information of how many interviewees discussed the factor and from which perspective. In the example, almost all interviewees have brought some insight to factors impacting patent validity and for instance 9 out of 13 have discussed patent scope in this context. We can also notice that the column for consultant C4 is empty due to the fact that the interviewee wished not to comment on the topic as it was not in the interviewee's area of expertise. The table quickly shows what was generally discussed around each issue and showcases which analysis sheet or transcript to return to for more specific information.

Table 4: Example of analysis on factors impacting patent validity

			Managers							Consultants					
Identified factors *(subfactors, rationale)*		**Sum**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
Patent scope		*9*	*1*	*1*		*1*			*1*	*1*	*1*	*1*		*1*	*1*
Broadness of scope	*The broader the scope, the more there is to find prior art to and the higher the uncertainty with regards to the scope of the patent*	*5*				*1*			*1*		*1*	*1*		*1*	
Clarity of language	*The more abstract the patent document is, the more uncertainty there is in terms of its scope*	*2*	*1*								*1*				
Geographical scope	*To enforce a patent (family) in a particular market, a firm needs to have patented in the market*	*2*		*1*											*1*
Backup steps in the patent document		*5*				*1*	*1*		*1*	*1*	*1*				
Narrowing option	*Validity can be strengthened by including backup steps in the patent document as patents can be narrowed (but not broadened) after being granted*	*5*				*1*	*1*		*1*	*1*	*1*				
Precision throughout patenting process		*5*		*1*		*1*	*1*				*1*			*1*	
Mistakes in patent drafting	*Mistakes in what was included in the patent document can be used for invalidation*	*4*		*1*			*1*				*1*			*1*	
Mistakes in communication	*Mistakes in communication such as early disclosure can be used for invalidation*	*2*				*1*	*1*								
Mistakes in patenting process	*Mistakes in the patenting process (e.g. paying fees and communicating with authorities) can be used for invalidation*	*4*		*1*			*1*				*1*			*1*	
Phase in patenting process		*5*		*1*		*1*		*1*		*1*		*1*			
Decisions in other jurisdictions	*Existing decisions on members of the patent family can be used as indicators of validity*	*3*		*1*				*1*		*1*					
Outcomes from prior attacks	*Outcomes from invalidation attempts by other firms can be used as indicators of validity*	*1*				*1*						*1*			

The calculation of mentions was used to check for whether there were enough interviews to reach saturation as well as for finding the factors that were most prominent based on the interviews. The number of mentions was not used to rank viewpoints. For example, if one factor got three mentions and another got four, both factors were included in the analysis as significant viewpoints. What is noteworthy, is how in line the points mentioned by the different interviewees were. As the points made by at least two interviewees weren't contradictory, and even the points made by only individual interviewees were mostly giving additional information, the interviews could be analysed in a rather straightforward manner. In the findings section therefore, when numbers of people who discussed a topic are marked in the text, this doesn't suggest that others disagreed with the point that was made. It simply means that they didn't directly discuss it.

A limitation to the analysis process is that the coding was conducted and validated by a single person so the dialogue on how the categories should be formed, which is recommended by Elo and Kyngäs (2008), was not a part of the process. However, for future research purposes, the analysis sheets have been created so that other researchers with access to the interview transcripts could check whether they agree with the interpretations made. To mitigate over-interpretation, the concepts and

categories were formed following a cautionary approach: a point in the transcript was more likely left out of the final analysis sheet if it was unclear how it should be interpreted.

3.4. ANSWERING THE RESEARCH QUESTIONS

To answer the research questions of the thesis, a framework linking the different theoretical factors contributing to license price to different patent management activity domains was formed based on literature. The findings from the interviews were than used to fill in the framework in the two different contexts of analysis: based on findings regarding a single patent licensing negotiation and based on findings regarding patent management activities and resources impacting value appropriation in licensing negotiations in general. The framework used for answering the research questions is presented in figure 8.

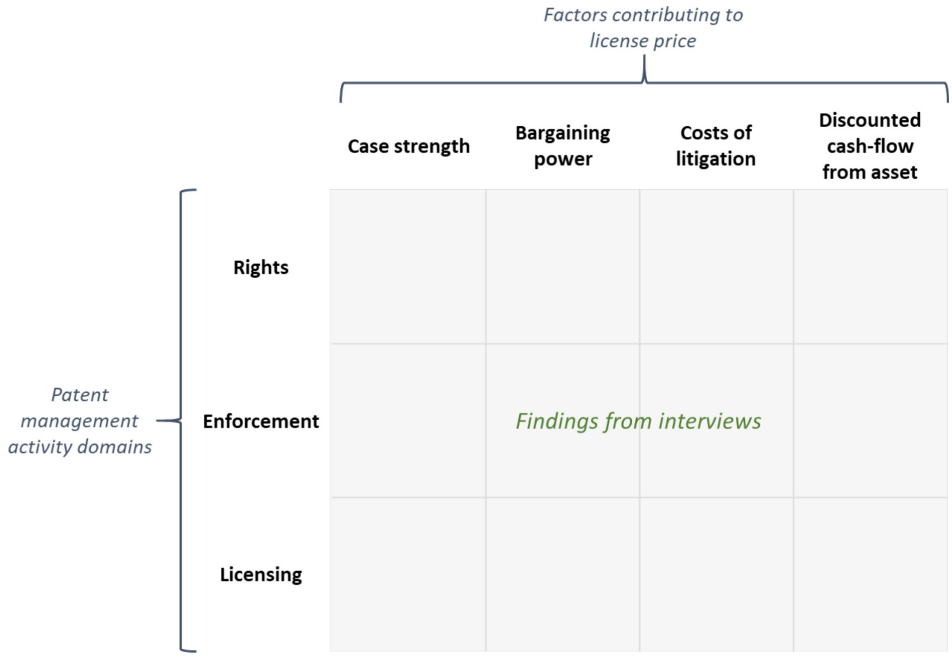

Figure 8: A framework for linking factors contributing to license price to patent management activity domains based on findings from interviews

In answering the research questions, the starting point for the analysis were the factors determining the columns of the framework (figure 8) which are the same as the parameters in the strategic valuation model (described in chapter 2.3.2). The factors were taken as given and served as the basis for the interviews, which described which factors impact the license price factors and how the identified

factors can be impacted. Based on these findings as well as on answers by the interviewees concerning different patent management activities and resources, activities and resources contributing to the license price factors were identified and mapped to the three patent management activity domains of rights, enforcement and licensing from theory.

4. FINDINGS

Chapters 4.1 and 4.2 focus on findings concerning *value appropriation through patent licensing* and, together with the theoretical framework presented in chapter 3.4, are used to answer the research questions of the thesis. Chapter 4.1 focuses on the findings that relate to the factors contributing to license price depicted by the strategic valuation model in chapter 2.3.2. Chapter 4.2 then elaborates on and summarises these by describing findings and conclusions on how the factors presented in chapter 4.1 link to different aspects of patent management from a managerial standpoint.

4.1. FINDINGS ON FACTORS IMPACTING LICENSE PRICE

Based on the interviews, the factors contributing to the patent owner's appropriated value from licensing negotiations can be affected within the short-term context of a single licensing negotiation and in the long-term context by different patent management activities throughout the IP value chain. Findings on the different factors depicted by the strategic valuation model (chapter 2.3.2) are discussed in chapters 4.1.1-4.1.4. Chapter 4.1.5 describes general findings on what the license price in pure patent licensing is based on and how the factors are linked to this.

4.1.1 CASE STRENGTH

In the interviews, case strength was discussed mostly from two main perspectives, patent infringement and patent validity, as these are the aspects needed to be able to enforce one's right in court and have to do with the patent document. These are also the viewpoints arising from literature relating to uncertainty of patent scope and validity. In addition, also other factors affecting case strength were discussed. These were factors not relating to the patent document that could affect a case if it went to court and which could also affect the licensing negotiation through expectations or in the case the negotiation would occur alongside ongoing litigation.

Patent infringement related questions where divided to detection of infringement and proving infringement as they are separate actions. In this chapter, the focus is on proving infringement as it is an enforcement activity impacting interpretations of the scope of the patent. Findings on detecting infringement are discussed in chapter 4.2.1.

For the patent to be enforceable against an infringer, its scope needs to cover the implementation of the technology under dispute in the infringer's products or processes and the infringement needs to be proven in court. Thus, **to prove infringement**, the patent owner needs to show two things: that the disputed technology is actually implemented in the product or process of the potential infringer (3/13) and that the patent covers the technology under dispute (4/13). As two interviewees mentioned, even if the product claims to implement a standard the patent is part of, there still needs to be evidence of the fact that the technology covered by the particular patent is implemented in the product.

Proving infringement requires resources as it involves gathering evidence by testing the product internally or externally and legal costs and use of experts if it is done by litigating[5]. The difficulty of proving infringement depends on each case and can have an impact on the costs of proving infringement[6]. The different factors impacting the difficulty to prove infringement are depicted in figure 9.

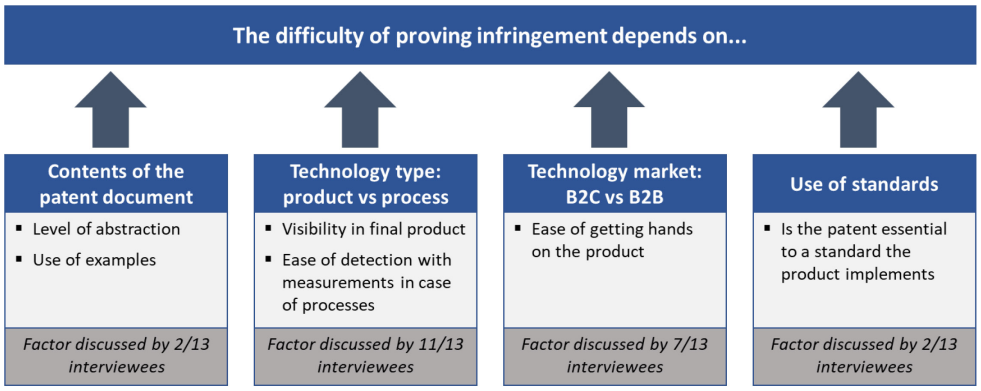

Figure 9: Factors impacting difficulty of proving infringement

The clearer the description of the technology in the patent document is, the easier the technology is to identify in the final product and the easier it is to examine the

[5] In cases where finding enough evidence to prove infringement is very difficult, the litigation process can also be used to gain more information about the disputed technology (7/13). In the US for instance, a pre-trial procedure called discovery can be used to gain more evidence which can be than used to boost the licensing negotiation further.

[6] According to the interviewees, proving infringement is usually more difficult than detecting it. A likely infringement may be easily detectable but being able to prove it in court can still be difficult or at least laboursome. For instance, a product may be compatible with a standard and showcase this in its packaging, but whether it implements a particular patented technical feature that is part of the standard needs to be shown separately.

implementation, the easier the infringement should be to prove. Another alleviating factor are standards, as their implementation in products or processes includes also the implementation of standard essential patents (SEPs). However, as one interviewee pointed out, not all patents that are claimed to be essential to a standard are truly essential to it[7]. Thus, this factor is likely to help most in cases where the essentiality of the patent to the standard has been tested in earlier cases and the patent has been found "truly essential" by a court.

In case the patent owner owns several patents likely infringed upon by potential licensees, the four factors in figure 9 can be used for selecting patents for licensing discussions. From a broader perspective however, the factors themselves can be impacted themselves by decisions on what types of patents the firm holds and how each patent is originally drafted. Therefore, the uncertainty with regards to patent scope can be affected also in the patenting and portfolio management activities – not just by the decisions as part of licensing.

For a patent to be strong in licensing and litigation, it needs to be both infringed and valid. In the interviews, the ways in which a patent owner can impact **patent validity** were discussed from two perspectives: how to pick the strongest patents from an existing portfolio (7/13) and what makes a patent strong in the first place (12/13). The first perspective focuses more on the "now" and is part of the decision-making in the licensing process whereas the second perspective takes a look back at earlier stages in the patent value chain and focuses on the decisions made in the patenting and portfolio management phases. The second perspective works as the basis for the first as it highlights the factors decision-makers should consider when picking patents for licensing. Factors impacting patent validity are summarised in figure 10.

[7] Essentiality of claimed SEPs is studied for instance by Stitzing et al. (2017) in the cellular industry. The study finds indicators of essentiality such as citations to and from other SEPs as well as declarations against technical documents which could be useful for firms trying to identify truly essential patents from their own or other's portfolio.

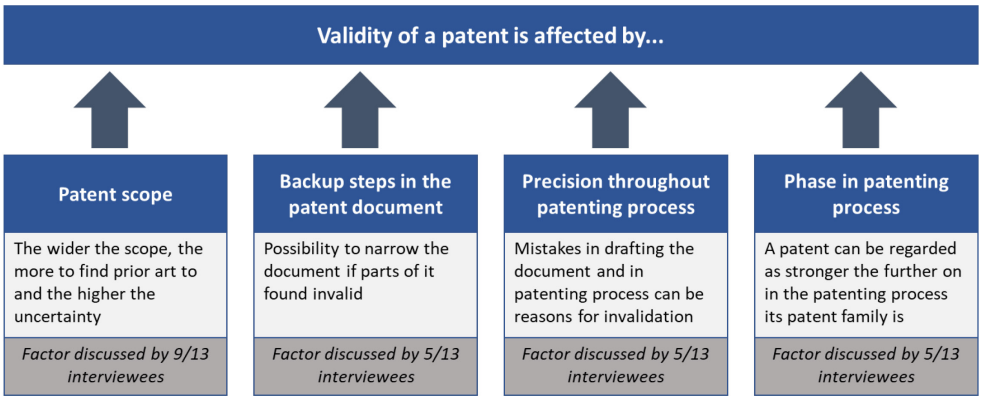

Figure 10: Factors impacting patent validity

The three first factors from the left (*patent scope*, *backup steps in patent document* and *precision throughout patenting* process in figure 10) have to do with work by the patent attorney in drafting the patent and of the actions of the company in the patenting process. By writing a "clear and concise" document, as one consultant described it, the patent attorney can limit the window for potential prior art that could be found and which might invalidate the patent. On the other, by writing the document so that it can be reduced and narrowed afterwards and still cover the technology it is meant to protect, the patent attorney can increase the likelihood of the patent to remain valid.

Several interviewees highlighted the importance of precision throughout the patenting process that concerns both the work of the patent attorney as well as the company. Mistakes in the patent document (such as missing names of inventors) and in the patenting process (such as making information about the innovation public too early or being inconsistent in the communication with the patenting office) can be used afterwards for patent invalidation. Due to the importance of getting things right the first time and not dropping the ball during the lifetime of the patent (by e.g. forgetting to pay patent maintenance fees to the patent office), some interviewees wanted to highlight the importance of using experienced patenting professionals in the patenting process (4/13).

The fourth factor impacting patent validity (figure 10), *phase in patenting process*, has to do with mitigating uncertainty by looking at indications of validity from patent grants and opposition throughout the patent family. The rationale of this indicator is that the more patent examination processes the patent family passes, the more likely the patent is to remain valid also in the future. Also, passed opposition

processes can be used as indicators of validity as well as indicators of potential value as opposition could indicate which patents are seen by other parties as threats.

In picking patents for licensing, some companies put in extensive resources to look for weaknesses in their patents themselves (2/13) to identify the patents most likely to remain valid and also to prepare themselves for the discussions in the licensing process. Firms for instance looked at which patents had been tested in court previously and remained valid to identify valuable and strong patents for licensing (2/13). According to one manager, companies should as part of this analysis also consider the strength of the opponents in the prior cases as this may have impacted the strength of the test the patents went through. The rationale is that the stronger the previous opponents trying to invalidate the patent have been, the more likely the patent is to remain valid in the future as well.

In addition to patent scope and validity, other factors not directly stemming from patent law were discussed. Here, topics such as litigation strategy, ability to convince judges, having the best people working for one's team and thorough preparation where brought up by the interviewees. Through the resource and capability positions of the firms negotiating, these factors are assumed to be part of issues impacting bargaining power (findings in chapter 4.1.2) in the framework and have to do with the link between enforcement and licensing (discussed more in chapter 4.2.1).

The overall uncertainty concerning case strength was mitigated by the licensing firms by including several patents or patent portfolios in licensing deals as opposed to licensing individual patents. This way, although the risk with an individual patent might be substantial, the uncertainty for the set of patents could remain reasonably low as the likelihood of all the patents in the case to be found invalid and non-infringing would be much lower than for individual patents. This once again emphasises the resource-intensiveness of licensing as it is not necessarily enough to have individual patents relevant to a patent implementor but to have multiple patents relevant to the implementor.

4.1.2 BARGAINING POWER

Based on the interviews, bargaining power is a case specific factor and relative to the other party in the negotiation. Factors impacting how bargaining power is

divided among two negotiating parties is summarised in figure 11. The theoretic factors are separate from that affecting case strength although some of them are closely linked to it. For instance, "what is being negotiated", a subfactor of the *resource position* of a firm, concerns the patents that are in the negotiation and their importance to the patent owner and to the patent implementor but can be also interpreted to cover case strength related issues.

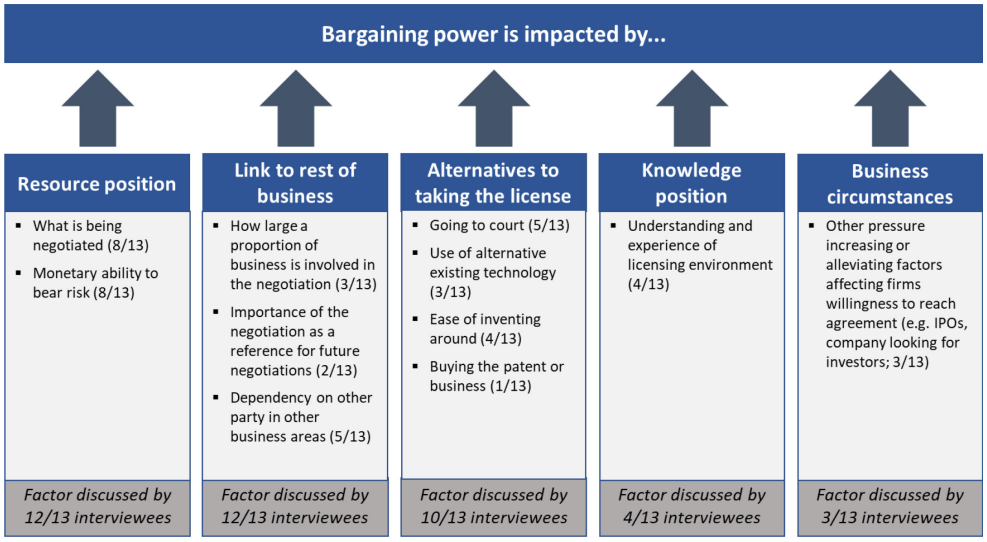

Figure 11: Factors impacting the bargaining power of the negotiating parties

On top of having to do with the importance of the assets being negotiated, resource position includes also the monetary ability of each party to bear risk of the case going to court. Litigation is expensive and uncertain and can take place in multiple jurisdictions at the same time. The firm that is more able to bear this risk, is likely to have more bargaining power in this regard.

The *link to rest of business* was discussed from multiple perspectives by the interviewees. First, the extent to which the patent implementor's business is exposed by the patent will have an impact on the negotiation (the more, the higher the bargaining power of the patent licensor). The importance of the negotiation as a reference on the other hand can be a reducing factor in terms of the licensor's bargaining power: especially in the case of a small licensor with no previous licensing deals, to get a deal to signal willingness to pay for other potential licensees, it may be willing to offer a lower price to the first licensee.

The relationship the licensor and the patent implementor have in other business areas can have an impact on the negotiated deal. As one manager wanted to

highlight, this doesn't necessarily mean that a license will be cheap to existing partners. It just means that the negotiation will also have to consider the overall business impact of the licensing negotiation among the negotiating parties.

According to one interviewee, the internal valuation of a patent license can be performed using a Best Alternative to Negotiated Deal (BATNA) analysis, which is basically what factor three, *alternatives to taking the license*, deals with. Here the general idea is that the more opportunities the firm has to reach its business goals without the license, the better its bargaining position in the negotiation is. As the alternatives can often be given a monetary estimate, they can be used as limits to how much the firm will be willing to pay for a license. Alternatives differ by case but include going to court instead of negotiating, using an alternative technology or inventing around the patent and buying the patent or the entire business of the licensor. The cost of finding technological alternatives depends on time and effort needed to come up with an alternative solution and the level of the technology in question: the more basic the technology is, the more difficult it is to find alternatives to it and the more bargaining power the patent owner is likely to have. Based on the interviews, the other alternatives are likely to be linked to company size as resource position can be expected to explain ability to litigate and make acquisitions. According to one manager, some big players are especially aggressive: instead of taking part in friendly licensing negotiations, they wait for the cases to be taken to court and then make the "war so big that very few firms […] have the means to bear the costs [of litigation]". This way, the firms deter also other licensing firms from approaching them in the future.

Knowledge position was referred to by the interviewees as the understanding of the negotiating parties of the licensing environment. This included tacit information about details of completed license deals in relevant industries as well as experience with licensing negotiations, knowing when to push a deal and on the other hand when to accept an offer. The party with the more experience could have more power due to the other side not having the same information and thus making decisions with a worse understanding of the context of the negotiation. With this point, the interviewees wished to highlight the importance of finding the right, experienced people to the licensing team. This however can be more easily said than done as one consultant mentioned that assessing the quality of the advice received can be very

difficult – especially for those companies with little experience in licensing beforehand.

Business circumstances were discussed by the interviewees as explanatory factors for both sides to try to reach agreement. In general, having cases open or closed affects companies differently in different circumstances. For instance, a firm about to make an initial public offering (IPO) may be risk averse and thus willing to accept license offers faster than a firm with little to lose. As one consultant described it: "Rate of growth can have an effect, […] if you're business is growing rapidly, you can have greater pressure. Conversely, if you're doing poorly, then you maybe have less pressure to take a license." Also, licensors looking for investors may be willing to keep cases open as then "there's still [value] potential", as one interviewee put it, as opposed to get valuations for their assets. All in all, this factor highlights the importance of understanding the business thinking behind the other side's decision making.

The five factors are closely linked and not necessarily mutually exclusive. For instance, the importance of the technology being negotiated has to do with its link to the business of each party and alternatives to using other technologies. Based on the different factors discussed by the interviewees, bargaining power could be summarised as *the need of each party relative to the need of the other party to reach agreement in the negotiation*. As an example, the more critical the license is to the business of the patent implementor, the worse its negotiating position, unless the licensor has significant deficiencies on its own side (for instance, inability to take the case to court).

The five factors are impacted by the licensor's decisions of which firms it chooses to approach in licensing negotiations as bargaining power is always relative to its opponent. In the long-term, the licensor can also impact its perceived bargaining power by for instance indicating ability to take cases to court. According to one consultant, you cannot take all your cases to court, but, as one manager described it, "if you have enough of these benchmarks [of having enforced your patents in court], then the threat of litigation is sufficient". By being credible in this regard, the licensor can mitigate its future risk of litigation and increase its likelihood of reaching license deals by purely negotiating. According to one manager, in some cases contracts between partners may be such that a large player takes care of enforcing a smaller player's rights. Thus, in the long-term, the licensor can also

impact its resource and knowledge position by teaming up with a better-resourced and more experienced player.

4.1.3 COST OF LITIGATION

Although the costs of litigation weren't in focus in the interview guide, they were discussed in several interviews. Overall, the costs of litigation were discussed as a significant cost to conducting licensing and a required cost to conducting pure patent licensing. As discussed in the previous chapter, although not every licensing case needs to be taken to court, according to the interviewees, some cases have to be in order to generate demand for the licenses covering only the use of the patented technology.

In practice, the costs of litigation depend on several factors. First of all, the costs (and who pays for what) differ by country. For example, based on the interviews, it is significantly more expensive to take part in litigation in the US than for instance in Finland. In addition, the costs differ depending on in how many markets the firms litigate. Although according to one consultant the smallest domestic cases may be resolved with tens of thousands of euros in legal fees, the largest cases involving several jurisdictions are in the millions. According to one manager, the costs of litigation include also the costs of preparation before taking part in any legal proceedings. In duration, the preparation was described by the manager to sometimes take as much time as the actual litigation. Despite the importance of preparation was emphasised by all the interviewees who discussed it, how much firms decide and need to invest in it and how much this preparation can be used for other cases the firm is part of is likely to differ.

For patent implementing small firms, the costs of litigation can also include the time involved in the litigation process that is away from focusing on the firms' core work such as product development or sales. According to one consultant, long negotiations attached to litigation can be detrimental to these firms in cases in which they in fact do not implement the patents under dispute. Even if they eventually are found not to be infringing the patents and are given freedom to operate, the time and resources put in fighting may still kill the firm. In the strategic valuation model, this issue is reflected by the resource position of the firm affecting bargaining power although in practice it can be thought of as part of the indirect costs of litigating.

From the patent licensing perspective, one manager wished to highlight, that although litigation costs are significant, licensing negotiations including litigation are "the tip of the iceberg". In most cases, legal actions don't need to be taken and based on the other interviews, even when legal actions are taken, the parties usually come up with an agreement before reaching trial or before the legal battle would be completed.

4.1.4 DISCOUNTED CASH-FLOW FROM ASSET

The discounted cash-flow from asset was not focused on in the interviews as it is an exogenous factor from the patent owner's perspective. However, the interviewees did discuss how it could be affected by the patent owner. When discussing patent picking for licensing, the interviewees mentioned considerations of both validity and infringement as well as business considerations. On top of picking patents that are likely to remain valid and cover the technological implementation, firms should choose patents that cover technologies that are actually used in products or processes and generating revenue in the market (2/13). Based on the interviews, licensing is a highly resource-intensive activity, often involving litigation, so it should be done with patents that bring value and generate returns to those implementing them to have potential to generate revenue to the licensor. In this regard, licensors should also target firms that are able to implement their patented technologies profitably.

To summarise, although the patent owner is not able to affect the commercialising decisions of the patent implementor, it may pick patents and licensing targets to a single negotiation or develop its licensing program and portfolio as part of its patent management activities by considering the commercial value of the patent implementations. Although commitments such as FRAND with SEPs may limit the patent owner's ability to pick whom to target for these patents (so it won't discriminate any potential licensee), the firm still can make decisions over which negotiations it invests most in to reach agreements.

4.1.5 PRICE OF LICENSE

When discussing what the price in pure patent licensing stands for, interviewees discussed it as the payment for neutralising the threat of being taken to court for using the technology covered by the patent (3/13) – in other words, the perceived value of avoiding litigation. Also, as the factors case strength, bargaining power and

cost of litigation are, based on the interviews, very closely linked, they could be combined to form *the threat of litigation*, which would include all the aspects concerning the patent, bargaining positions of the players and the associated costs of litigation and would together explain the license price based on the negotiation whereas the discounted cash-flow from asset would remain to stand for implementation.

In the interviews, the impacting factors for reaching agreements on the license price were also summarised. To reach agreement and come up with a license deal, the patent implementor needs to be convinced of its need for the license (6/13), the price of the license (2/13) and of the patent owner as a partner (2/13). To be convinced of the need for the license, the patent implementor needs to be convinced that there is a considerable threat of litigation (5/13) and of its own business need for the technology the license covers (3/13). To accept the price of the license, the implementor needs to be convinced that the price is reasonable from the perspective of its own business (2/13) and it can help if there are reference prices from previous deals to show that there are also others who have paid this much (2/13) or more. Finally, the implementor needs to be convinced of the patent owner as a trustworthy partner. As one interviewee mentioned, this can be especially difficult with tough rivals. Most of these factors link to specific factors depicted by the strategic valuation model and to specific factors discussed already in chapters 4.1.1-4.1.4. However, the softer and more human issues of trust and being able to work with people from different cultural backgrounds are not necessarily depicted by the model directly. As these factors were highlighted by many of the interviewees (5/13), they are likely to be important in practice and are discussed more in chapter 4.2.2 when resources and capabilities needed for licensing are discussed.

4.2. FINDINGS ON PATENT MANAGEMENT FROM LICENSING PERSPECTIVE

Based on the interviews, different resources, capabilities and patent management activities can be identified that support licensing in the context of individual licensing negotiations as well as throughout patent management. Findings on resources, capabilities and activities from a patent licensing perspective are described in chapters 4.2.1 and 4.2.2. Chapter 4.2.3 focuses on findings on patent licensing in practice which cover broader notions of patent licensing than the one-

sided pure patent licensing, which is in focus in the theoretical framework used for answering the research questions of the thesis.

4.2.1 RESOURCES AND CAPABILITIES

Based on specific answers regarding the required resources to succeed in licensing and on conclusions made from findings summarised in chapter 4.1., resources and competencies needed to succeed in patent licensing negotiations are summarised in figure 12 with examples. Other than *monetary resources*, the different competence areas link to the different human resources and types of capabilities needed to succeed.

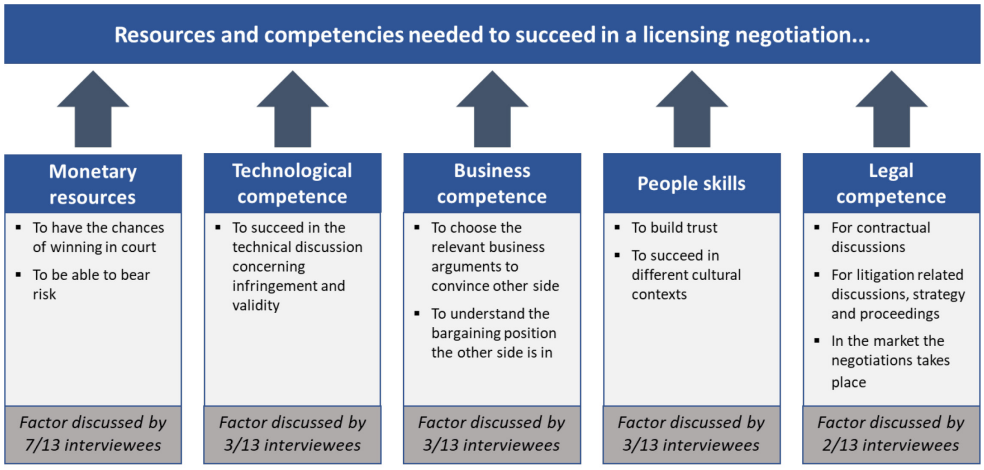

Figure 12: Resources and competencies needed for licensing negotiations

The different factors cover the technological, legal and business capabilities that rose from literature (chapter 2.2.3). Based on the interviews, all of these capabilities should be represented for a patent owner to succeed in distinct licensing negotiations. The lack of *technological competence* was for instance seen as a specific weakness of some licensing firms. According to one manager, "patenting is in the end all about understanding the technical environment". Creating claim charts and convincing the patent implementor that they in fact use the patent and that this could be proven requires technological competence. *Legal competence* is required from many aspects including contractual issues and litigation. Also, this competence was characterised as market-specific as rules, regulations and thus the patent owner's ability to enforce its rights may differ by market. *Business competence* was seen as an important factor for reaching deals as, on top of referring to benchmarks of what others have paid earlier for similar licenses, targeted arguments based on

the specific business circumstances of the patent implementor were seen as important by the interviewees.

On top of the monetary resources and the technological, legal and business competencies, three interviewees with backgrounds focused on licensing wished to highlight *people skills* as one competence area. This includes factors such as building trust, which was seen by one manager as important similarly to as part of any sales work: "the [negotiators on the other side] need to convince the leadership of their own firm that if they make this [license deal] they aren't make a huge mistake. […] You need to build a level of trust that the opponent believes that they aren't being fooled." In addition, different cultures play a role in how specific negotiations play out as does the relationships between the people negotiating. According to one consultant, in some cases negotiations can be advanced by changing people in the team.

Although the factors described in figure 12 refer to the specific context of licensing negotiations they can be applied more broadly to patent management. Technological and legal competencies are required by the patenting, portfolio management and enforcement activities. Business competence could be seen as needed for developing the patent management from the licensing perspective and that way to portfolio management and determining the business cases of whom to approach with license offers. In addition to the factors mentioned, several interviewees mentioned the invention as an important starting point - of holding a patent to a commercially significant technology.

4.2.2 ACTIVITIES AND OUTSOURCING

Based on the interviews, activities from across the patent management capability and from the two major activity domains (rights and enforcement, as referred to in chapter 2.2.3) can be identified to support or be part of licensing. In this chapter findings on these activities as well as their role in value creation and appropriation is summarised and the topic of activity outsourcing in patent management context is discussed.

Both **patenting** and **portfolio management** (the activities forming the rights activity domain) were discussed in the interviews as important activities for setting up the patent use potential to the patent owner. The decisions made in these activities

as well as the quality of work conducted throughout the patenting process were described to impact directly the quality of the patents and therefore the threat of litigation through case strength as well as the strategic alternatives of the patent owner. An example of this was given by one consultant as the possibility to split markets by licensing to specific geographical locations or to specific use cases. Although in prior literature these activities have been referred to as value appropriating (Reitzig and Puranam 2009), from a licensing perspective they can be regarded as value creating as the decisions of what to include in the patent document and to which markets to file for a patent and create translations are points at which value potential are created. However, these activities can be seen also as potentially value diminishing as some of them, such as paying maintenance fees, are routine activities but if done incorrectly, destroy the value of the patent asset.

Enforcement was seen as a key activity domain for patent licensing. The enforcement activities that were discussed linked to patent licensing are **litigation** and **detecting infringement**. Based on the interviews, the former generates demand for the patent licenses whereas the latter is about identifying demand in the market. In terms of value creation and appropriation, both can be categorised as value creating activities from a licensing perspective.

Litigation was seen as a key activity for patent licensing. As described in chapter 4.1.5, the price of a pure patent license was described by the interviewees as the price for minimising the threat of litigation. In addition, the licensing negotiation in big cases was described to occur often alongside an ongoing legal process. In the examples given by the interviewees, it was often the different phases in the legal process that sped up or muffled ongoing licensing negotiations as the litigation fed more information to the parties in the negotiation or the start of a legal process demonstrated the willingness of the patent owner to enforce its rights and thus made the threat of litigation more credible to the patent implementor. Although not necessary for every license deal negotiated, litigation as an activity seems to be a requirement for licensing-focused patent management based on the interviews.

Companies had different routes to detecting infringement that were linked to the market they operated in. Companies in the process industry or in industries where the patented technology was implemented in heavy machinery or as part of a process within a plant trained their sales staff who travel a lot and visit customers' sites to know how to look for potential infringements. Other companies, whose technologies

are implemented in B2C products, could look for information from company websites, purchase devices made by their competitors or as one interviewee put it, sometimes watch as people online pulled the products to pieces on videos. Different approaches to detecting infringement are summarised in figure 13.

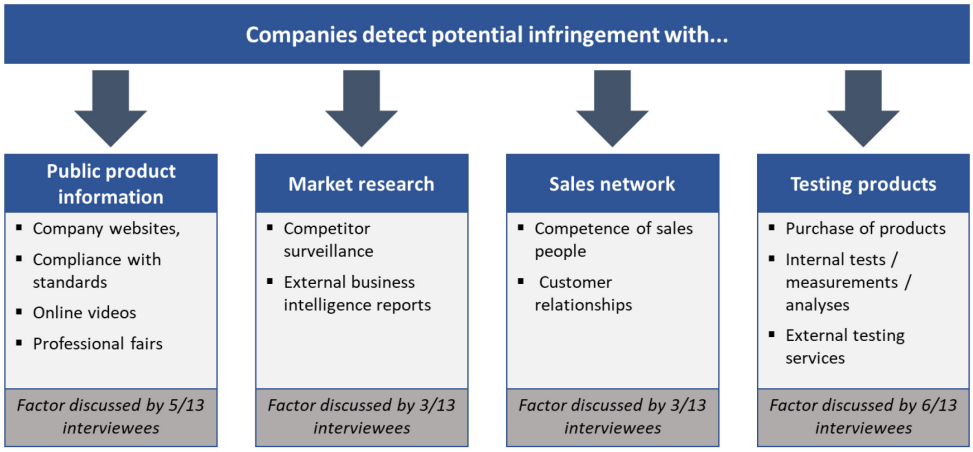

Figure 13: Different approaches to detecting potential patent infringement

Companies approach to looking for potential infringements differed: one of the managers of the licensing-focused firms described the process as portfolio-based (going through the portfolio to find patents likely to be infringed by firms in the market and then looking for patent implementing firms) whereas other managers discussed a more reactive approach focusing on teaching people outside the patent management capability to identify potential infringements. The answers suggest that licensing-focused firms could be more proactive in looking for potential infringements compared to firms following different patent strategies. However, whether these approaches can be identified more broadly when comparing firms conducting different patent strategies should be studied further to draw conclusions.

Based on the interviews, patent use related activities (excluding commercialisation) include activities such as **preparing for and conducting negotiations** and **strategy work** (which could also be referred to as business development). Of these activities, strategy work can be seen as value creating whereas the activities that are part of the licensing negotiations can be seen as value appropriating. In addition to these activities, the interviewees discussed also **compliance and contract management**, which are activities conducted after reaching license deals to ensure that the licensees act according to what was agreed upon. For the licensing firm, they are then again also value appropriating activities, just focusing on a latter phase in the

licensing process then has been discussed thus far: making sure that the price that was agreed upon gets paid by the licensee.

The **outsourcing** of different patent management activities was also discussed in the interviews. According to the interviewees, companies that patent or conduct patent licensing usually utilise external capabilities in at least some of their patent management activities, and in the case of small and medium sized enterprises (SMEs), the interviews indicate that in most. Based on the interviews, activities that are often outsourced include patenting and litigation whereas coordination of the different patent management activities are usually conducted internally. When asked about activities that would be especially difficult to outsource, the interviewees described work involving strategic decisions concerning the firm's portfolio. As one consultant described it, most work can be done by someone external to the company but decision-making is difficult to outsource. Factors impacting the decisions of firms to outsource are summarised in figure 14.

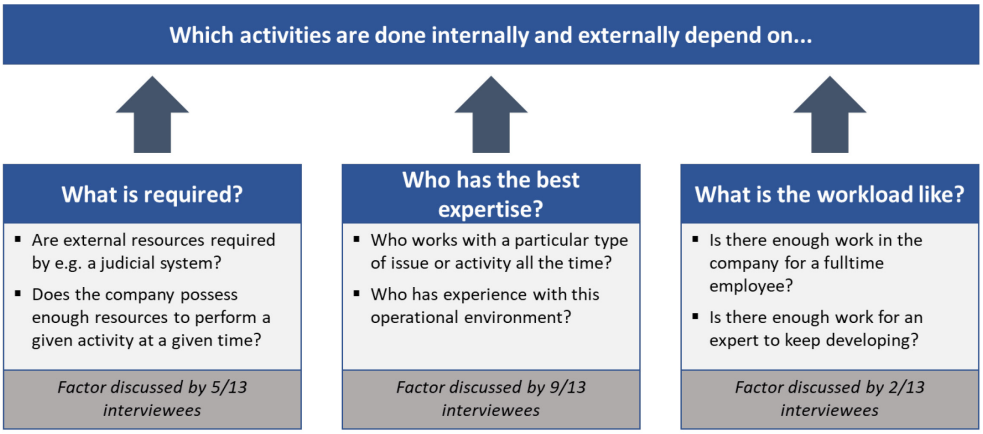

Figure 14: Factors impacting outsourcing decisions

Based on the interviews, requirements, expertise and workload should be considered when making decisions about outsourcing. If certain expertise is required temporarily but not possessed internally, it needs to be acquired from external sources. Also, hiring internal experts may not make sense if there isn't enough work for professional development as the expertise may not continue to evolve and may even diminish with lack of practice, which was the rationale described by a manager of one of the firms. Based on these factors, many of the patent owning firms represented in the interviews had chosen a model in which most of their patent-related activities were conducted by external service providers. Only the firm with the largest portfolio had a number of employees working with patent-related matters

that could cover most of the patent-related activities, yet even this company outsourced specific tasks continuously.

4.2.3 DIFFERENT FORMS OF PATENT LICENSING

Although the focus in the strategic valuation model (described in chapter 2.3.2) is on one-sided pure patent licensing, it is noteworthy that in the interviews much of the conversations around practical cases revolved around either wider agreements (e.g. agreements including patent sales or paying for products or technological know-how) or cross-licensing. As one manager explained: "that type of licensing business, in which we make money by selling licenses, we do a little but [that part of the business] is very small." Also, when discussing pure patent licensing, patent sales were mentioned by one interviewee to be sometimes used in deals to mix things so that the deal wouldn't be so useful for future parties trying to use the deal as a benchmark. Based on the interviews, in practice pure patent licensing, unless as conducted in its two-sided form of cross-licensing, is likely not the norm but the exception in patent licensing. It is either not done or it is muddled so as to avoid being too transparent to other players in the market.

When the licensing negotiation included also other things such as sales of patents or wider technology agreements (4/13), what the license price stood for were somewhat muddled and could be argued to stand for something else than simply neutralising the threat of litigation (e.g. for paying for a product or service). According to one of the managers, in case of negotiating a business-to-business product sale, the sale of patent licenses come often baked into the sale. Based on the interview, this makes patent value appropriation easier for the patent owner for two reasons: as the sale of a license is attached to something more concrete, a product, it can be easier to convince the customer to pay and as the sale is in the firm's case based on an upfront payment instead of e.g. sales unit based royalties, it doesn't have to consider compliance activities to make sure the royalties received match the royalties that should be received based on actual sales of the licensee.

In the interviews, different reasons for why manufacturers might be interested in licensing were discussed. These reasons included industry characteristics and new technology launches. For example, in industries in which transportation is difficult and multiple plants in different geographical location are required to serve the market (such as the glass industry discussed by manager M5), it can make sense to

license the technology to other markets and profit from them without having to make the investments to expand production. According to one manager, in this type of industry it can be also easier to conduct licensing in general as the different market players are used to the idea of licensing (whereas in industries without this operating logic the first responses to licensing efforts might be more hostile). Another reason to license a technology would be to help spread a new technology to the market (2/13). This could be to have more firms' marketing efforts in educating the market to switch to a new product type (as mentioned by one consultant) or if getting the product to market would require many players in the first place as could be with technologies requiring interoperability.

Overall, licensing in the interviews was discussed as a targeted effort deeply linked to the strategic goals of the firm. When not used as the means for generating income, it can be used to boost other objectives of the firm. As one manager described it, "it is all about getting things moving forward, getting our products to sell, getting this concept built and the licenses are in a way included in reaching the goal we have".

5. DISCUSSION

5.1. ANSWERS TO THE RESEARCH QUESTIONS

To answer the research problem, "**What activities and resources should a patent owning firm invest in to appropriate value from its patents in licensing negotiations?**", two research questions were formulated focusing on activities and resources contributing to value appropriation in the context of a single licensing negotiation and in the long-term context of patent management. In this chapter answers to the research questions based on theoretical and empirical analysis are demonstrated.

The first research question was: "**What activities and resources contribute to the patent owner's appropriated value in a single licensing negotiation?**" As an answer to the first part of the question, a table depicting the different patent management activities contributing to the patent owner's appropriated value is presented (table 5). The table is based on the theoretic framework for answering the research questions, which was represented in chapter 3.4., and depicts the activities affecting the factors contributing to license price that were identified from interviews.

Table 5: Activities contributing to the patent owner's appropriated value in a single licensing negotiation

	Factors contributing to license price in the strategic valuation model			
Activity domains	**Case strength**	**Bargaining power**	**Costs of litigation**	**Discounted cash-flow from asset**
Enforcement	▪ **Proving infringement:** e.g. creating claim charts ▪ **Litigation:** getting additional proof of infringement	▪ **Litigation:** demonstrating litigation threat	▪ **Litigation:** deciding on litigation strategy	
Licensing	▪ **Choosing patents:** identifying strengths and weaknesses in own patents, choosing the number of patents to involve in the negotiation	▪ **Strategy work:** choosing the potential licensee ▪ **Choosing patents:** identifying important patents to licensee ▪ **Negotiation:** convincing the other side of their need for the license	▪ **Strategy work:** choosing the potential licensee	▪ **Strategy work:** choosing the potential licensee ▪ **Choosing patents:** identifying patents covering commercially significant technologies

Based on the licensing context summarised by the strategic valuation model and interviews, the main activity domains contributing to value appropriation in the

context of a single licensing negotiation are licensing and enforcement, licensing being the main activity domain and enforcement the supportive one. Specific contributing licensing activities include *choosing patents*, *negotiation* and *strategy work*. The decisions of which patents are chosen to the negotiation contribute to license price in the framework in three ways: Firstly, patent picking is the main way to affect case strength in the negotiation as by identifying strengths and weaknesses in the patents and by picking several patents (instead of picking one) the patent owner can mitigate uncertainty relating to patent scope and validity. By choosing patents that cover commercially significant technologies to the potential licensee, the patent owner can also impact the discounted cash-flow from asset in question in the negotiation as well as its own bargaining power relative to the licensee. In licensing negotiations, the main strategy work has to do with picking the potential licensee with which to take part in the negotiation. This decision affects the bargaining powers of the players as they are relative to who is on the other side as well as to the discounted cash-flow from asset as this is based on the actions of the licensee. In addition, choosing the licensee can have an impact on the expected costs of litigation as there are differences in how extensive legal battles firms are willing to participate in based on the interviews.

Specific contributing enforcement activities include *proving infringement* and *litigation*, which can be also used to help in proving infringement. Proving infringement as an activity is required for communicating to the potential licensee its need to get the license based on the scope of the patent and how it is implemented in the licensee's products or processes. Litigation as an activity on the other hand can be used to boost ongoing negotiations with an unwilling licensee by adding pressure to the negotiation and demonstrating litigation threat. The patent owner's own litigation strategy is also likely to impact the costs of litigation in the framework at least through the steps that are demonstrated to the other side (in the sense that, if an agreement cannot be reached, the patent owner has indicated taking the case to court somewhere).

The activities discussed involve specific resources such as specialised experts in the form of patent attorneys, lawyers and negotiators as well as the patent portfolio of the patent owning firm and the monetary assets and human resources affecting the possibility to take the case to court. Patent attorneys are used for example for technical aspects of licensing negotiations and for proving infringement as part of

enforcement, lawyers for contractual issues in the negotiations and for litigation and negotiators for the licensing discussions with the potential licensee. The patent portfolio of the firm limits the firm's possibilities of choosing patents for licensing whereas its resource position in terms of resources that can be channeled to litigation limit its bargaining power.

The second research question was: "**What activities and resources contribute to the patent owner's appropriated value throughout patent management?**" Similarly to answering the first research question, contributing activities are represented in table 6.

Table 6: Activities contributing to the patent owner's appropriated value throughout patent management

	Factors contributing to license price in the strategic valuation model			
Activity domains	Case strength	Bargaining power	Costs of litigation	Discounted cash-flow from asset
Rights	▪ **Patenting:** setting basis for patent scope and validity ▪ **Portfolio management:** developing portfolio based on patent strength	▪ **Portfolio management:** developing portfolio from demand perspective	▪ **Patenting:** drafting of document (affects difficulty of proving infringement), filing for patents in different markets	▪ **Patenting:** filing for patents in different markets ▪ **Portfolio management:** developing portfolio considering market exposure
Enforcement	▪ **Litigation:** creating benchmark assessments of patent scope and validity	▪ **Litigation:** demonstrating litigation threat, creating demand for licenses		▪ **Detecting infringement:** identifying potential licensees
Licensing		▪ **Negotiation:** creating benchmark deals for future negotiations		▪ **Strategy work:** developing licensing program from demand perspective

From the long-term patent management standpoint, the patent owner's appropriated value in the licensing negotiation is impacted by work prior to the negotiation in the three patent management activity domains of rights, enforcement and licensing. Although rights related activities didn't play a significant role in the individual negotiation context, they are essential early factors when considering the IP value chain. The two main activities here, *patenting* and *portfolio management* impact the opportunity horizon of the licensing-focused patent owner by defining what the patents are that the firm has to conduct licensing with both in terms patent strength and commercial significance. The activities have implications for all the factors contributing to license price in the strategic valuation model as can be seen from table 6. Even cost of litigation is indirectly impacted by the decisions made in the

patenting activity as they impact the difficulty to prove infringement in court and how large a legal battle is possible based on the size of the patent family.

From the value appropriation perspective in patent licensing context, the patent enforcement activities of *litigation* and *detecting infringement* play significant roles in generating and identifying demand for patent licenses. By taking cases to court, the patent owner signals to potential licensees that the threat of litigation is real and that there are credible reasons to pay for the patent license. Court decisions on specific patents can be also used as evidence of case strength and the stronger the previous opponents have been, the stronger the indication of strength can be thought to be based on the interviews. Detecting infringement on the other hand consists of identifying potential licensees for licensing negotiations based on implementations of the patented technology or based on identified needs of firms to start implementing the patented technology.

Based on the interviews, licensing needs to be seen as a continuum in which work in the licensing activities (*negotiation* and *strategy work*) in earlier licensing negotiations contribute to future negotiations as well. The results from negotiations are benchmarks both for future licensees as well as for the patent owner and decisions made as part of business development impact how the licensing is developed as a program. By creating good benchmarks by gaining evidence of completed deals or of favorable license prices from the patent owner's perspective, the patent owner improves its ability to appropriate value with license agreements in the future as well.

Throughout patent management, the specific resources called upon are the same as in the context of a single licensing negotiation. They simply take part in a wider range of activities as for instance the patent attorneys contribute to the rights related activities and the lawyers support here with contract related issues.

Based on the answers to the two research questions, to appropriate value from licensing negotiations, the patent owning firm needs to invest in all of the three activity domains of rights, enforcement and licensing and in the distinct resources supporting these activities. The key activities, whether the patent owner is an NPE or a manufacturer, are those of portfolio management (including patent picking), litigation, detecting infringement, negotiation and strategy work. Of these, portfolio management (including purchase of patents) and litigation can be expected to

require heavy investments but they can be seen as the foundation for licensing as holding something others are willing to pay for can be expected to be key to any sales negotiation. The other activities, especially that of detecting infringement, are likely to require lighter investments but are part of the core work of a licensing-focused firm.

5.2. THEORETICAL CONTRIBUTION

As one of the contributions of this thesis, the three-stage IP value chain by Reitzig and Puranam (2009) could be updated from a patent licensing standpoint by incorporating the three patent management activity domains of Somaya (2012) into it. The updated value chain was depicted in chapter 2.2.3. In addition, distinct contributing activities to each patent management domain where identified from interviews and these were categorised to value creating and value appropriating based on their role in the patent licensing value chain. The activities and the role in value creation and appropriation were discussed in chapter 4.2.2.

The findings of this thesis support the findings of Reitzig and Puranam (2009) of capabilities required by patent management. The capabilities highlighted by their work on the IP value chain, technical, legal and business, are also the capabilities highlighted by the framework described in this thesis and the capabilities mentioned and described by the interviewees. To appropriate value from its patents in licensing negotiations, a patent owning firm needs for instance technical and legal capability to navigate the technical-legal discussion around the patent right as well as business capability to understand the opposing side and find the best arguments to convince the other party of their need and of the price of the license.

The findings also highlight the importance of patent enforcement to patent licensing. Based on prior work described by Somaya (2012) and on the findings from interviews, it is a key component to the so-called pure patent licensing in which the license covers only rights to use specific patents of the patent owner. As described in the interviews, in pure patent licensing, the threat of litigation is the only reason to pay for a license and the credibility of this threat determines whether to pay and, based on the strategic valuation model, how much to pay for the license.

In addition, different types of “soft skills” were identified as needed to succeed in licensing negotiations, which are not usually highlighted by economic models. In

the strategic valuation model, they could be included as one of the factors affecting the bargaining power parameter as they are competencies of the same resources that affect the other factors affecting bargaining power.

By combining game theory with resource-based thinking and using qualitative interviews, the thesis presents a descriptive framework that bridges the gap between economic literature and managerial insights and showcases how by focusing on value appropriation at the moment of licensing negotiations, understanding of the importance of earlier stages in the patent value chain from a specific strategic standpoint can be deepened. Although the thesis cannot be used to test theory, suggest that combining different perspectives and methodologies to analyse a well-defined practical context is useful in descriptive work to come up with frameworks that could be tested in future research. In addition, the findings support the use of then chosen frameworks by being very much in line with for instance the outcomes predicted by the strategic valuation model.

5.3. MANAGERIAL IMPLICATIONS

Based on the theoretical and empirical analysis of licensing-focused patent management, patent licensing is resource-intensive and requires the consideration of each activity domain that are part of patent management. In addition, the inherent uncertainty of patents needs to be considered when conducting licensing in practice.

What is perhaps helpful to managers is that in the early stages of the IP value chain (R&D and patenting), the licensing-focused leveraging strategy does not compete with the needs of the so-called proprietary strategy as both benefit from strong patents. Also, firms following a defensive patent strategy are likely to hold patents with exposure to the market which is similarly needed for patent licensing. As a practical implication, investments in the patenting and portfolio management following strategies aimed at commercialisation also enable shifting to a licensing focus afterwards. This was also the case with two of the firms interviewed which focused on licensing for the part of their patent portfolio that they no longer implemented themselves.

Based on the findings of this thesis, litigation is a requirement for a sustainable leveraging strategy. A patent owner is unlikely to get licensees if potential licensees realise it is not able to enforce its rights in court. On the other hand, litigation can

be regarded as a demand generating activity which strengthens both the patent owner's bargaining power as well as the strength of its assets for future licensing negotiations. As firms cannot sue everyone, the essential strategic question is what type of a reference is the firm looking for. Based on the interviews, the biggest legal battles won are likely to be the strongest references for future negotiations but they can also be the ones to sink the patent owner's business. To gain references but stay afloat, firms should try to choose their battles wisely.

To mitigate patent related uncertainty, licensing firms usually include several patents or bundles of patents in licensing negotiations instead of just individual ones. As an example, in the interviews, the interviewees discussed choosing the patents for the negotiation in plural. The need to mitigate uncertainty also affects the earlier stages of the IP value chain as firms can protect their inventions with multiple property rights (e.g. by patenting several features or combining different types of intellectual property rights for protection).

Although licensing-focused patent management requires investments to different activities, patent owners conducting licensing don't need to take part in all the activities that are part of patent management or the IP value chain. Based on the interviews, outsourcing of patent management activities is common and in the case of SMEs, nearly all activities apart from strategic decision-making can be outsourced. Based on the focus in literature on NPEs and on the interviews, a licensing-focused strategy does also not require the firm to conduct R&D: the patented inventions may be developed by the patent owner or the ownership of the patent may have transferred after the invention has been made.

Based on the interviews, pure patent licensing in practice is not the norm but the exception for many of the firms conducting licensing. However, by understanding the difficulties of pure patent licensing, firms can apply its logic to circumvent some of these difficulties. For instance, if the firm doesn't have the resources to litigate, it can try to bundle the patents to an agreement including also other things such as sales of patents or technology. In the same vein, a small technology firm willing to leverage their inventions through licensing could attempt partnering up with a larger market player that could help the smaller firm enforce its rights and that way generate demand to its licenses.

5.4. LIMITATIONS AND FUTURE RESEARCH

The theoretical framework which the analysis of the thesis is built on is based on several assumptions which need to be considered when interpreting the results and using it to analyse licensing-focused patent management and value appropriation in practice. The main limitations of using the framework and suggestions for future research are discussed next. As a general area of interest in future research would be testing the findings of this thesis with practical cases as currently the findings are only descriptive.

The first limitation of the framework is that it is based on assumptions concerning pure patent licensing and the way it is discussed in this thesis, one-sided patent licensing, where one firm acts as a licensor and another as a potential licensee. As it attaches the price of the license strictly to factors impacting the threat of litigation, it doesn't depict license deals that include also other sales items such as technology products, know-how or patents, which is often how patents get licensed in practice. However, by focusing on pure patent licensing, the framework does give insight into why this may be the case in practice as it highlights the many requirements of patent licensing. The current framework is also not built for analysing cross-licensing. However, by developing the strategic valuation model further, the strength of the patents and the exposure these patents have to the business on each side could be depicted by the factors in the model in the future which could broaden the use of the framework.

A limitation of the strategic valuation model the theoretical framework is built on is that it describes the licensing negotiation of an individual patent. In reality, and for reasons highlighted by the model, patents are often licensed in bundles. Although the model highlights the reason why this is done and is sufficient for describing the relevant factors impacting value appropriation in licensing, it should be developed further as a model to portray the licensing of multiple patents to be useful for analysing actual completed license deals usually involving several patents.

The strategic valuation model assumes that the negotiating parties are rational, which may not always be the case in practice. As some of the interviews mentioned, rivalry in the product market can for instance spill over to licensing discussions by making them more difficult then perhaps they would be if the parties wouldn't have issues due to their tough rivalry. However, rationality could be expected to generally

apply to long negotiations in which both sides call upon experienced negotiators and, in that sense, be a sensible assumption for the descriptive analysis in this thesis. In addition, by focusing on the negotiation as the point at which value is appropriated, the analysis also implies a level of trustworthiness of the licensees which can be a strong assumption considering that some of the experts interviewed specifically mentioned the need for compliance and contract management after reaching agreements to make sure what was agreed upon actually comes true. Research on these activities would be probably complementary to the findings in this thesis and would help draw a wider picture of the factors impacting value appropriation in patent licensing in practice.

Lastly, the rational for litigation in the framework and in this thesis is based on and limited to countries and jurisdictions where rule of law apply. In legal systems impacted by politics and which favor national players, operating as a foreign licensor is likely to be affected also by factors outside the scope of this thesis and these factors should be taken into consideration when conducting licensing across the globe.

6. CONCLUSIONS

The purpose of this thesis was to offer managerial insights into factors that are important to consider when developing patent management with a strategy focused on licensing. The research problem was: **What activities and resources should a patent owning firm invest in to appropriate value from its patents in licensing negotiations?** By analysing this question, the thesis shed light on key issues managers should factor into their decision-making when deciding which activities and resources they should channel their limited resources to if attempting to leverage their patents through licensing.

The theoretical analysis for this study was done by dividing the patent management capability into its activities and supporting resources and capabilities as well as by presenting a game-theoretic model depicting the value appropriation context that served as the basis for answering the research problem of the thesis. Based on earlier research, three key activity domains of rights, enforcement and licensing were identified. Also, several resources in addition to patents where identified.

The strategic valuation model emphasised four factors impacting value appropriation in patent licensing negotiations: case strength, bargaining power, cost of litigation and the discounted value from the asset in which a patent is implemented. The four factors were analysed based on 13 expert interviews with managers and consultants representing different patent management units and activities. Based on the interviews, activities and resources contributing to value appropriation in the context of an individual licensing negotiation and throughout patent management were identified and linked to the three activity domains of patent management.

Based on the findings of this thesis, value appropriation in licensing-focused patent management depends on the resource position and the relative capabilities of the patent owning firm compared to its potential licensees. For the patent management to be on sustainable foothold, the firm should invest in choosing its patents and opponents in licensing negotiations and in all the three activity domains that form patent management as part of the patent value chain. For firms conducting pure patent licensing and not tying patent licenses to other deals, investing in patent enforcement is especially important as the price of the license is directly dependent on the credibility of the threat of litigation.

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APPENDIXES

Appendix 1: Interview guide for managers.

Section	Main question	Follow-up questions
Background information: role of patents, patent use, strategic importance of patents, defining entitity (NPE / PE)	Describe the role of patents for your company's business.	Approximately, how many patents / patent families does your company own? Are the patented technologies developed by your company or have they been acquired? Are the patented technologies used in your company's products or processes? Are the patents a source of income for your company? Are they licensed? Do the patents have other use-cases that are important for your company? For your company's business, how important are patents? How about compared to other intellectual property rights?
Background information: experience with assertion, importance of assertion based thinking in company context	How many patent cases does your company deal with yearly?	In these cases, how often are you the targeting party vs the targeted party? What is the risk of your company being targeted by other companies? How many are negotiated? How many are litigated?
Background information: context impacting patent use	Are there any commitments or other external factors that impact the way your company can use its patents?	Are your patents for instance part of standards? Do you need to consider the FRAND principle when determining royalties?
Resources: size of unit / team, mix of experts	Company specific wording: How many people work in the patent business unit / in your team / with patent related matters in your company?	How many of them work full-time vs part-time with patent related matters? What types of academic backgrounds or professions are represented?
Resources: specialization, level of expertise within organization	How specialized are their roles?	Do you have different people for administrative, judicial and business development activities? Do different peope focus on different technologies?
Resources: bargaining power, importance of model	Does your company have a budget for patent assertion?	
Resources: use of internal capabilities outside patenting	Company specific wording: What type of collaboration is there between your patent unit/team and other units/teams inside the company?	With which unit / team? How often / closely?
Resources: external capabilities, extent of outsourcing, type of capabilities (administrative / judicial / business)	What types of patent related services do you buy from other companies i) in your daily business ii) in assertion cases?	
Parameters: context, typical case	Describe a typical patent case your company deals with.	Who claims infringement? What type of company is on the other side (NPE / PE, size, portfolio size, competitor, industry, IP strength)? How large of a portfolio do you have compared to the other side? How is the case solved? EXTRA: Has the typical case changed over the years?
Parameters, case strength: detection of infringement, technological / market context, actions / capabilities	If your company's patented technology is used without permission by another company, how is this infringement detected?	Is infringement easy to detect (when your company's patent are concerned)? Do you look for these cases actively? Could you describe the process for detecting infringement?
Parameters, case strength: proving infringement, capabilities for proving infringement	In a typical case, how difficult is it to prove in court that an infringement has occurred?	If difficult? What sort of expertise is needed for this? Does your company have internal experts for this? Do you use external resources for this?
Parameters, case strength: patent strength, impacting factors	Can you describe some of the characters that are important for patent validity?	What makes a patent weak?
Parameters, case strength: patent strength, impacting capabilities	How can you increase your chances of holding a valid patent?	
Parameters, case strength: other factors	What other factors (in addition to being able to prove the infringement and having a valid patent) impact the likelihood to "win" the case or get a favourable result?	
Parameters, profit; price of license: determining royalties	In a typical case, how are royalties determined?	What determines what the "cake" is and how it is "sliced"?
Parameters, profit; price of license: impacting model, resources	Can you impact [how the royalties are determined]?	How? Do you use internal or external experts the who focus on issues related to this? What do they work on?
Parameters, bargaining power: impacting factors	In a typical case, what determines how long your company can continue with a negotiation?	
Parameters, bargaining power: link between units of business, potential examples	Company specific wording: In a typical case, how much do you have to consider the impact the negotiation may have on other units of business / the rest of your company's business / your company's primary business?	Can you give an example?
Parameters, case strength: link between case strength and negotiation	Does the strength of your case (which was discussed earlier) affect your company's eagerness to continue the negotiation?	